

A Revision of the Old World Species of the Genus *Eurema* HÜBNER (Lepidoptera, Pieridae)

Part III. Description of the *sari* group (part)

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Abstract Redescriptions are given at species and subspecies levels for the *sari* groups (12 species) in the subgenus *Terias*. The following aspects of each recognized species and subspecies are presented: current combination, synonymy, diagnosis, external features, male and female genitalia, variation (seasonal and geographical), type material examined, material studied, taxonomic remarks, relationship, distribution, habitat, habits, early stages; adults of every recognized taxon, and male and female genitalia of every species are illustrated.

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Eurema sari (HORSFIELD, 1829)

[Pls. 1-3]

Terias sari HORSFIELD, 1829: 136, ♀. (Java)

Terias sodalis MOORE, 1886: 45, ♂ ♀. (Mergui)

Diagnosis: Upperside of male wings lemon yellow in ground colour; black distal border on forewing upperside obtuse-angled at vein 4, more deeply excavated

in space 2 than in space 3; apical patch on forewing underside large, quadrate and entirely dark chocolate; a spot in discoidal cell; vein-dots on underside not conjoined with black anteciliary line; uncus moderately long and arched dorsally, with uncal projection fairly developed.

Description: Male. *Upperside:* Ground colour lemon yellow. Forewing black costal border usually broad with its inner margin sharply defined; black distal border generally broad, with its inner edge oblique and irregular from costa to vein 4, more or less angled in the midway, obtuse-angled at vein 4, more deeply excavated in space 2 than in space 3, almost perpendicular to basal margin or inclined slightly towards base in spaces 1a and 1b+c; black basal border undeveloped; discocellular spot absent; fringe black. Hindwing black distal border usually somewhat narrow, tapering near apex and tornus, with its inner edge usually somewhat diffused and weakly zigzag-shaped, sometimes projected along each vein; anal border undeveloped; fringe black, sometimes mixed with yellow. Basal portions of both wings narrowly blackish. *Underside:* Ground colour slightly paler than on upperside. Forewing apical patch large, quadrate and entirely dark and chocolate with luster; a 3-shaped spot in discoidal cell; discocellular marking represented by an irregular slender ring, covering more than half of the discocellular vein; tornal spot always developed; sex-brand usually pale salmon pink, long and narrow, ending slightly before a point of origin of vein 2; small vein-dots conjoined with a catenate black anteciliary line; fringe black but mixed with yellow. Hindwing with a series of submarginal spots in spaces 1b+c to 8, arranged in an irregular zigzag-line, and a submarginal spot in spaces 7 and 8 usually comma-shaped and directed to midway between submarginal spots and discocellular spot; circular subbasal spot usually present each in spaces 1b+c and 7 and in the middle of discoidal cell, but a spot in cell often disappearing; a minute basal spot absent; discocellular spot almost same as in forewing but larger; small vein-dots appearing in various degree, but not conjoined with a prominent black marginal streak; fringe yellow, but mixed with black. Ultraviolet reflectance on upperside: Structurally reflective on yellow area except for tornal to anal region of hindwing, but diffused distally, appearing bright-white in UV-photos (Pl. 21 (3, upper) in Part II).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black and white-checked, except on the postero-dorsal surface and a few apical segments, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal line appearing along the lateral margin of abdominal terga.

Forewing length: 19.0–23.5 mm.

Female. Similar to male, but differing as follows. Ground colour pale green-

ish yellow, and on underside somewhat paler. *Upperside*: Basal portions of both wings more heavily and extensively black dusted. Forewing black costal border narrower, with its inner edge more strongly diffused; black distal border broader, especially in hindwing, diffused posteriorly and scattered black scales continued along vein 1b+c, with its inner edge diffused. *Underside*: Apical and tornal spots more strongly developed but somewhat paler. Ultraviolet reflectance on upperside: Almost absorbed, appearing grey to entirely black in UV-photos (Pl. 21 (3, lower) in Part II).

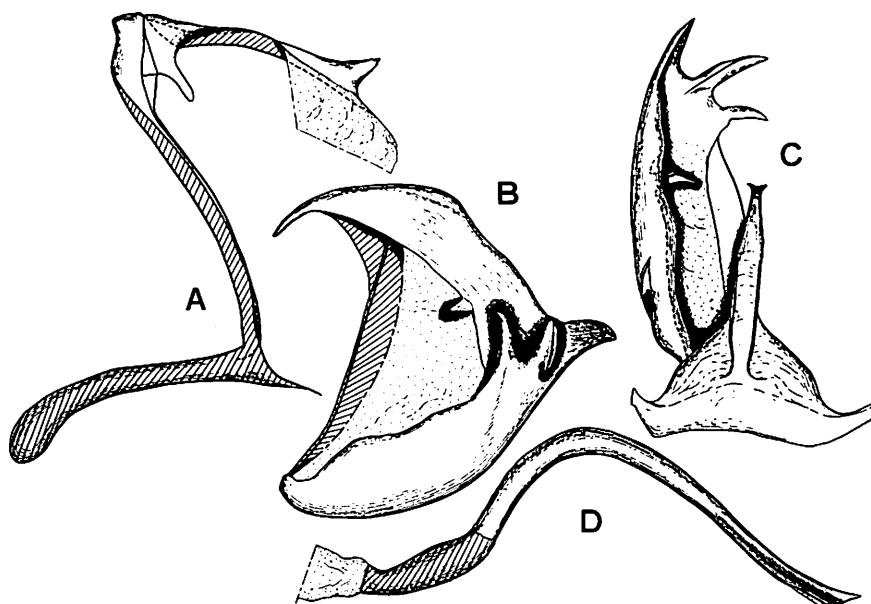


Fig. 1. Male genitalia of *Eurema sari sari* (HORSFIELD, 1829) from Java. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

Forewing length: 18.5–22.5 mm.

Male genitalia (Fig. 1): Tegumen narrow, triangular in dorsal aspect, slightly concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus moderately long (0.7–0.8 of ring height), angle between vinculum and saccus 80–90°. Uncus usually moderately long (dorsum proper 0.61–0.68 of ring height), arched dorsally, extending strongly downwards; uncal projection short (0.1 of ring height), almost triangular in lateral aspect, projecting posterodorsally, with its apex weakly bicuspid. Valva somewhat shorter than high; P1 somewhat weakly sclerotized, much shorter than P4, extending almost laterally or somewhat anteriorly; P2 absent; P3 broad and triangular, with a pointed apex; P4 represented by two processes, distal one of which are much longer than

proximal one and more strongly curved ventrally. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as $1/4$ length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

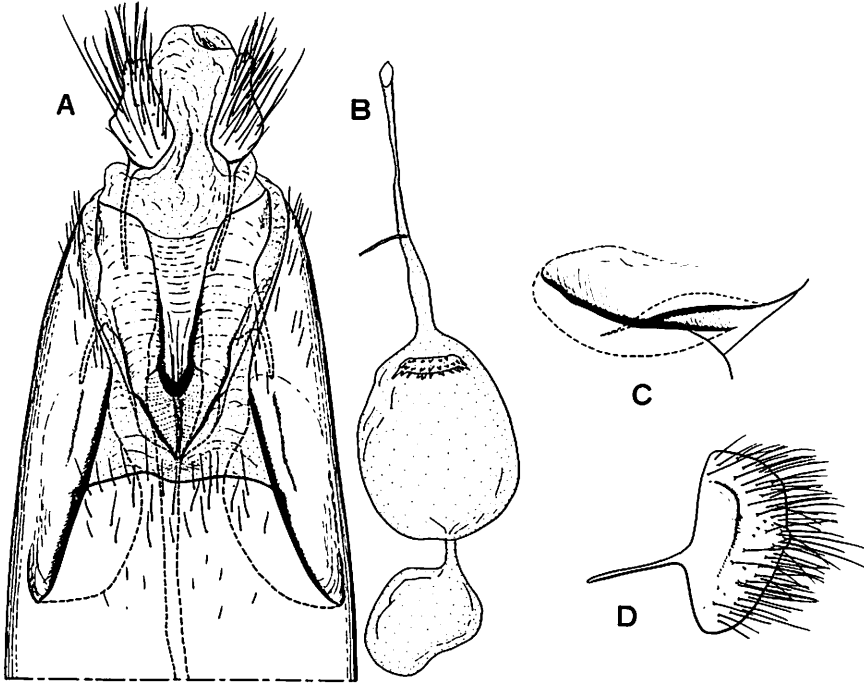


Fig. 2. Female genitalia of *Eurema sari sari* (HORSFIELD, 1829) from Java. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Lateral hollow (lateral). D: Papilla analis (lateral).

Female genitalia (Fig. 2): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, with dorsal eaves absent, ventral eaves long and deep, median groove long, having a eaves situated ventral $1/3$ of lateral hollow. Genital plate weakly invaginated ventromedially, obtuse-angled on its anterolateral corner in ventral aspect; longitudinal groove weakly sclerotized, broad and deep, gradually broadened posteriorly; banks of longitudinal groove well developed, somewhat compressed near ostium bursae, distinctly stippled regularly on antegenital portion. V-shaped wall undeveloped. Ostium bursae opening at the anterior $1/3$ of genital plate. Ductus bursae about 1.67 length of cervix bursae, membranous but weakly sclerotized on anterior $1/3$. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, nearly as long as apophysis posterioris, hamulated upwards apically, with a prominent protuberance at the inner margin of proximal portion.

Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: Although this species has rather wide distribution within the *sari* subgroup, its geographical variation is not so remarkable as in *E. andersoni* or *E. sarilata*. It shows some geographical variations in wing markings such as the black distal border on hindwing upperside. Seasonal variation is unknown.

Taxonomic remarks: The next species, *Eurema sarilata* had been considered as conspecific with the present species. In 1973, however, HOLLOWAY raised *sarilata* to specific rank based mainly on male genital structure.

Relationship: This species is closely related to *E. sarilata* and the two seem to form a monophyletic group, with which *mentawiensis* is united.

Distribution: This species has fairly broad range within the *sari* subgroup. It is distributed almost all over the Oriental Region, from India across Indo-China and Sundaland.

Habitat and habits: This butterfly mainly inhabits lowland forests, and it is commonly found in forest edges or paths through forests. The abundance differs considerably throughout this range. The flight is fairly swift for this genus. This species is multivoltine, and it is found flying all the year round in the subtropical and tropical regions.

Early stages: The early stages are poorly known. According to PIEPERS and SNELLEN (1909), the larva and pupa are greenish in general colouration, and the larval foodplant is *Pithecollobium bigeminum*.

Eurema sari sari (HORSFIELD, 1829)

Terias sari HORSFIELD, 1829: 136. LECTOTYPE ♀ (Java) here designated. [BMNH, examined]

Terias sari sari HORSFIELD; FRUHSTORFER, 1910: 170.

Eurema sari sari (HORSFIELD); CORBET & PENDLEBURY, 1932: 181.

The nominate subspecies is characterized by the following combination of characters.

Male (Pl. 1 (1–2)). *Upperside:* Hindwing black distal border somewhat narrow, with its inner edge distinct and projected along each vein. *Underside:* Forewing with sex-brand pale salmon pink; in hindwing small vein-dots not conjointed with a catenate black anticiliary line and faint black dots appearing at marginal middle point of each space. **Female** (Pl. 1 (3–6)). *Upperside:* Hindwing black distal border very broad with its inner edge strongly projected along each vein. *Underside:* Marginal small vein-dots not conjointed with a catenate black anticiliary line and faint black dots appearing at marginal middle point of each space.

Forewing length: Male 21.5–22.5 mm (n=3, avg=22.0 mm), female 20.0–21.0 mm (n=2, avg=20.5 mm)

Type material examined: *Terias sari* was described from an unstated number of male and female specimens from 'Java' by HORSFIELD. The BMNH now possesses a

female specimen, which bears the labels: 'Type (red) / Java. 60. 15 / Terias sari ♀, type Horsf'. In addition the male bears the following labels; 'Lectotype (purple) / Terias sari Horsfield LECTOTYPE det. O. Yata 1990' and hereby designated lectotype.

Material studied: JAVA: W. Java, 2 ♂, 10. iii. 1966, 1 ♂ 1 ♀, Jakarta, 16. vi. 1966 [NSA]; E. Java, Popoh, 1 ♀, 16. iii. 1958 (JACOULET) [OMNH].

Distribution: This subspecies occurs only in Java.

***Eurema sari thyreus* (FRUHSTORFER, 1910)**

Terias sari thyreus FRUHSTORFER, 1910: 170. LECTOTYPE ♂. (Engano) here designated. [BMNH, examined]

Eurema sari thyreus (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 181.

This subspecies is distinguishable from the nominate subsp. *sari* from Java by the following combination of characters.

Male (Pls. 1 (7–8), 2 (1–2)). *Upperside:* Forewing black distal border with its inner edge more evenly concaved in spaces 2 and 3. *Underside:* Forewing with sex-brand pale brown; small vein-dots almost conjointed with a catenate black anticiliary line, not having a faint black dots at marginal middle point of each space. On forewing apical patch narrowly projected posteriorly; ternal spot distinct and not so elongate. **Female** (Pl. 2 (3–4)). *Upperside:* Forewing black distal border somewhat broader, with its inner edge more roundly concaved in spaces 2 and 3. Hindwing black distal border broader. *Underside:* On forewing apical patch more strongly developed, narrowly conjointed with ternal spot.

Forewing length: Male 19.5–21.0 mm (n=2, avg=20.3 mm).

Type material examined: *Terias sari thyreus* was described from an unstated number of male and female specimens from 'Engano' by FRUHSTORFER. The BMNH now possesses a male and a female specimens. The male specimen bears the labels: 'Type (red) / Engano, April-Juli Fruhstorfer / sari thyreus Fruhstorfer / Fruhstorfer Coll., B.M. 1937–285'. In addition the male bears the following labels; 'Lectotype (purple) / Terias sari thyreus Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels, and in addition the following labels; 'Paralectotype (blue) / Terias sari thyreus Fruhstorfer PARALECTOTYPE det. O. Yata 1990'.

Material studied: ENGANO: Engano Is., 1 ♂, 18. xi. 1984 [KUCGE]; 1 ♂, iv–vii, 1909, (FRUHSTORFER) [RNH].

Distribution: This subspecies is known only from Engano Is.

***Eurema sari sodalis* (MOORE, 1886)**

Terias sodalis MOORE, 1886: 45, ♂ ♀. LECTOTYPE ♂. (Mergui) here designated. [BMNH,

examined]

Terias sari sodalis MOORE; FRUHSTORFER, 1910: 169.

Terias sari obucola FRUHSTORFER, 1910: 170. (Palawan & S. Borneo) **Syn nov.** [BMNH, Syntypes ♀ ♂, examined]

Eurema sari sodalis (MOORE); CORBET & PENDLEBURY, 1932: 181.

Eurema sari obucola (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 181.

This subspecies is distinguishable from the nominate subsp. *sari* from Java by the following combination of characters.

Male (Pl. 2 (5–8)). *Upperside*: Hindwing black distal border sometimes somewhat broader, with its inner edge more indistinct and not clearly projected along each vein. *Underside*: Forewing with sex-brand pale salmon pink; small vein-dots sometimes conjoined with a catenate black anteciliary line, usually not having a faint black dots at marginal middle point of each space. **Female** (Pl. 3 (1–4)). Ground colour somewhat darker. *Upperside*: Hindwing black distal border with its inner edge not clearly projected along each vein. *Underside*: Forewing with small vein-dots sometimes conjoined with a catenate black anteciliary line, usually not having a faint black dots at marginal middle point of each space.

Forewing length: Male 19.0–23.5 mm (n=17, avg=21.4 mm), female 18.5–22.5 mm (n=7, avg=20.6 mm).

Type material examined: *Terias sodalis* was described from an unstated number of male and female specimens from 'Mergui' by MOORE. The BMNH now possesses a male and a female specimens. The male specimen bears the labels: 'Co-type (yellow) / Mergui Moore Coll. 1907–190. / *Terias sodalis* ♂, type Moore / 573.1d'. In addition the male bears the following labels; 'Lectotype (purple) / *Terias sodalis* Moore LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels (Mergui ♀, Feb. 82/ 573.1e), and in addition the following labels; 'Paralectotype (blue) / *Terias sodalis* Moore PARALECTOTYPE det. O. Yata 1990'.

Material studied: CAMBODIA: Kampot, Tuk Chhov, 3 ♂, 17. vi. 1962 (S. INOUE) [KUCGE]. THAILAND: Trang, 1 ♀ [DBA]. MALAY PENINSULA: Cameron Highland, Tanah Rata, 3 ♂, 26. ii. 1970 (S. SUZUKI) [MUFA]; Mersing, 1 ♀, 15. iv. 1969 (NISHIMURA); Singapore, 1 ♀, 21. iv. 1969 (NAKAYAMA) [KUCGE]. BORNEO: N. Borneo, Sarawak, Kuala Bok, 2 ♂ 1 ♀, 1. iii. 1969 (ARITA) [MUFA]; S. Borneo, Samarinda, 2 ♂, 24. iv. 1977 (UÉMURA) [KUCGE]. SUMATRA: T. Rampung, 1 ♂, 13. xii. 1973, 1 ♀, 4. xii. 1973 (HISAKAWA) [KUCGE]; E. Sumatra, Mandi, 1 ♂, 24. vi. 1922, 1 ♀, 13. x. 1922 (KUSUNOKI) [KUFA]. PALAWAN: Taguliat, 2 ♂, 21. i. 1971 (A. MIYATA) [KUCGE]; Quezon, 1 ♂, 9. xii. 1969 (Y. MIYATAKE), 1 ♀, 12. xii. 1969 (HIURA) [OMNH].

Distribution: This subspecies is distributed from Indo-China to Sundaland.

***Eurema sarilata* (SEMPER, 1891)**

[Pls. 3–7]

Terias sarilata SEMPER, 1891: 254, t. 41, fig. 10, ♂ (Panaon), 11, ♂ (S.E. Mindanao), 12, ♀ (Cam. de Mindanao). (Mindanao & Panaon)

Terias mindorana BUTLER, 1898: 73. (Mindoro)

Eurema sarilata (SEMPER); HOLLOWAY, 1973: 149. (Mindanao)

Diagnosis: Upperside of male wings lemon yellow in ground colour; black distal border on forewing upperside obtuse-angled at vein 4, more deeply excavated in space 2 than in space 3; apical patch on forewing underside large, quadrate and entirely dark chocolate; a spot in discoidal cell; tornal spot absent in male, barely traceable in female; vein-dots on underside conjointed with black anticiliary line; uncus long and arched dorsally, with uncal projection weakly developed.

Description: **Male.** *Upperside:* Ground colour lemon yellow. Forewing black costal border usually fairly broad with its inner margin sharply defined; black distal border geographically variable in width, with its inner edge oblique and irregular from costa to vein 4, more or less angled in the midway, obtuse-angled at vein 4, more deeply excavated in space 2 than in space 3, usually inclined towards base in spaces 1a and 1b+c; black basal border usually undeveloped, but sometimes fine black dusting from distal border in space 1a extending towards base along hind margin; discocellular spot sometimes present; fringe black. Hindwing black distal border geographically variable in width; tapering near apex and tornus, with its inner edge usually somewhat diffused, waved or zigzag-shaped, anal border sometimes weakly developed; fringe black, sometimes mixed with yellow. Basal portions of both wings narrowly blackish. *Underside:* Ground colour slightly paler than on upperside. Forewing apical patch large, quadrate and entirely dark and chocolate with luster; a small spot in discoidal cell; discocellular marking represented by an irregular slender ring, covering more than half of the discocellular vein; tornal spot usually absent, if present barely traceable; sex-brand usually light gray with pale salmon pink, long and narrow, ending slightly before a point of origin of vein 2; small vein-dots always conjointed with a distinct black anticiliary line; fringe black. Hindwing with a series of submarginal spots in spaces 1a to 8, arranged in an irregular zigzag-line, and a submarginal spot in spaces 7 and 8 almost quadrate or comma-shaped and directed to midway between submarginal spots and discocellular spot; circular subbasal dot present each in spaces 1b+c and 7; a minute basal spot absent; discocellular spot almost same as in forewing but larger; small vein-dots always conjointed with a distinct black anticiliary line; fringe black. Ultraviolet reflectance on upperside: Structurally reflective on yellow area except for tornal to anal region of hindwing, but diffused distally, appearing bright-white in UV-photos (Pl. 21 (4, upper) in Part II).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing

slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black and white-checked, except on the postero-dorsal surface and a few apical segments, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal line appearing along the lateral margin of abdominal terga.

Forewing length: 17.0–24.5 mm.

Female. Similar to male, but differing as follows. Ground colour pale greenish yellow, and on underside somewhat paler. *Upperside*: Basal portions of both wings more heavily and extensibly black dusted. Forewing black costal border somewhat narrower, with its inner edge more strongly diffused; black distal border broader, diffused posteriorly and scattered black scales continued along vein $1b+c$, with its inner edge diffused. *Underside*: Apical spot more strongly developed; tornal spot sometimes barely traceable. Ultraviolet reflectance on upperside: Almost absorbed, appearing gray to entirely black in UV-photos (Pl. 21 (4, lower) in Part II).

Forewing length: 19.0–25.0 mm.

Male genitalia (Fig. 3): Tegumen narrow, triangular in dorsal aspect, slightly concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus long (0.7–0.8 of ring height), angle

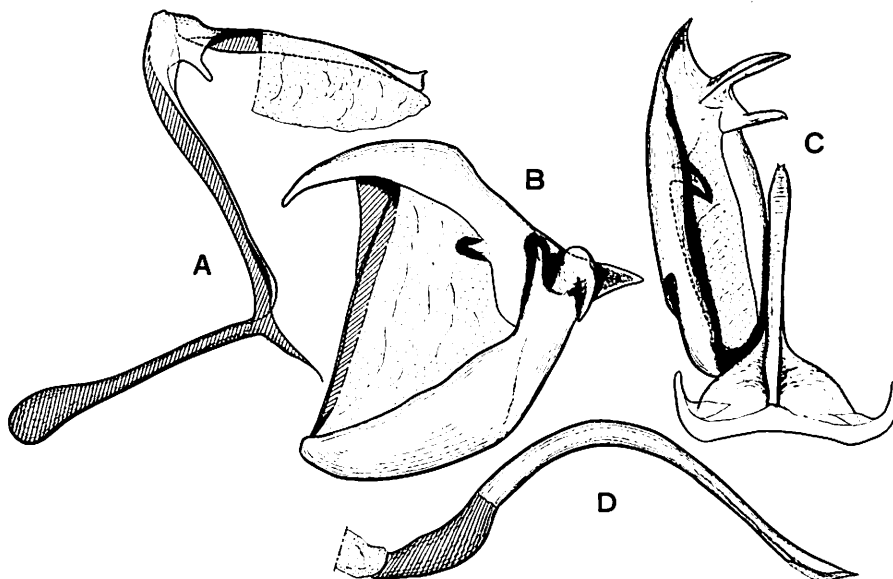


Fig. 3. Male genitalia of *Eurema sarilata sarilata* (SEMPER, 1891) Mindanao. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

between vinculum and saccus $80-90^\circ$. Uncus long (dorsum proper $0.8-0.85$ of ring height), fairly arched dorsally, extending strongly downwards; uncal projection poorly developed ($0.06-0.09$ of ring height), projecting posterodorsally, with its apex weakly bicuspid. Valva somewhat shorter than high; P1 somewhat weakly sclerotized, much shorter than P4, extending anteriorly; P2 absent; P3 broad and triangular, with a pointed apex; P4 represented by two processes, distal one of which are much longer than proximal one and more strongly curved ventrally. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as $1/4$ length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

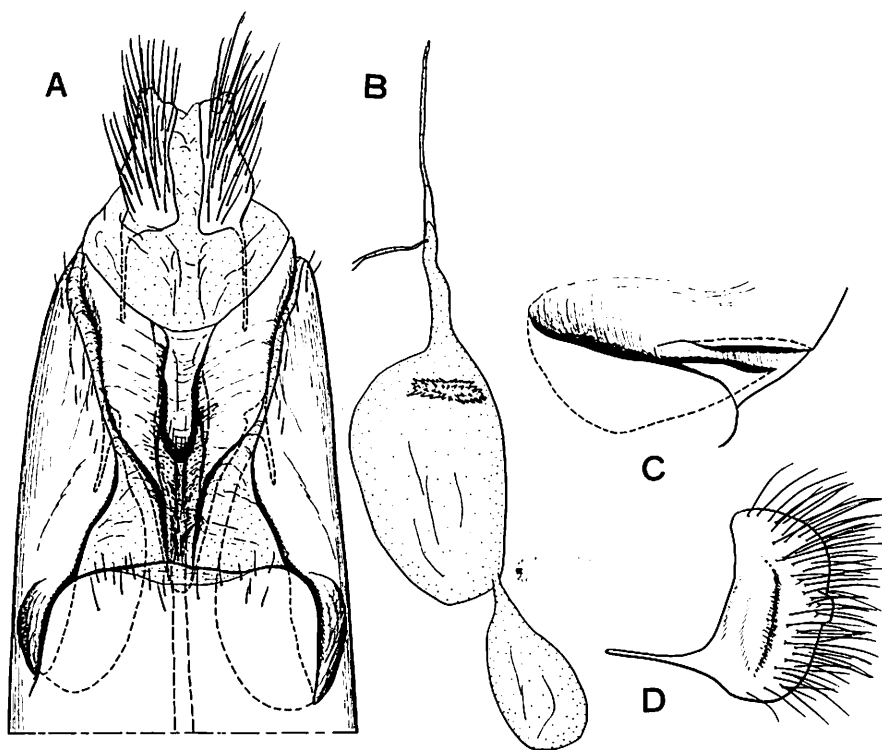


Fig. 4. Female genitalia of *Eurema sarilata sarilata* (SEMPER, 1891) Mindanao. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Signum (anterior). D: Lateral hollow (lateral). D: Papilla analis (lateral).

Female genitalia (Fig. 4): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, with dorsal eaves absent, ventral eaves long and deep, median groove long, having a eaves situated ventral $1/3$ of lateral hollow. Genital plate weakly invaginated ventromedially, obtuse-angled on its anterolateral corner in ventral aspect; longitudinal groove weakly sclerotized, broad

and deep, gradually broadened posteriorly; banks of longitudinal groove well developed, somewhat compressed near ostium bursae, weakly excavated around ostium bursae and the excavation stippled regularly. V-shaped wall undeveloped. Ostium bursae opening at the anterior 1/3 of genital plate. Ductus bursae about 1.67 length of cervix bursae, membranous but weakly sclerotized on anterior 1/4. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, nearly as long as apophysis posterioris, hamulated upwards apically, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: In contrast to *E. sari*, the present species shows considerable geographical variation in wing markings in spite of its restricted distribution. Seasonal variation is not seen at least in C. & S. Philippines.

Taxonomic remarks: This species has long been considered as the subspecies from the Philippines of *Eurema sari*. In 1973, however, HOLLOWAY raised the Philippine races (*mindorana* from Mindoro and *sarilata* from Mindanao) to specific rank based mainly on the male genitalia.

Relationship: This species is closely related to *E. sari* and these two seem to form a monophyletic group, with which *mentawiensis* is united.

Distribution: This species is endemic to the Philippines. It is hitherto known from Mindanao, Tawitawi, Basilan, Talauds, Panaon, Dinagat, Leyte, Samar, Negros, Masbate, Sibuyan, Mindoro, Marinduque, Luzon and Babuyan.

Habitat and habits: This butterfly mainly inhabits lowland forests, and it is sometimes found visiting flowers in forest edges or paths through forests. In Luzon it is usually common *Eurema* butterfly to be found in mountainous forest. The flight is not so swift for this genus. This species is multivoltine, and it is found flying all the year round.

Early stages: The early stages are poorly known. According to FUKUDA (1973, 1974), in Mt Maquiling, Luzon, the larva and pupa are similar to those of *E. alitha* except that the mature larva is more strongly tinged with blue and has more swollen tips of setae, and the pupa has deeper green dorsal line. The larval foodplant is *Albizia* species having peculiar swelling and occasionally *Ventilago oblongifolia* (Rhamnaceae) which is the larval foodplant of *Gandaca harina* in Mt. Maquiling.

Eurema sarilata sarilata (SEMPER, 1891)

Terias sarilata SEMPER, 1891: 254, t. XLI, fig. 10, ♂ (Panaon), 11, ♂ (S. E. Mindanao), 12, ♀ (Cam. de Mindanao). (Mindanao & Panaon) [untraced]

Terias mindorana BUTLER, 1898: 73. (Mindoro Is.)

Terias sari sarilata SEMPER; FRUHSTORFER, 1910: 170.

Terias sari crinatha FRUHSTORFER, 1910: 170. (South Philippines)

Eurema sari sarilata (SEMPER); CORBET & PENDLEBURY, 1932: 182.

Eurema sarilata sarilata (SEMPER); HOLLOWAY, 1973: 149.

The nominate subspecies is characterized by the following combination of characters.

Male (Pl. 3 (5–6)). *Upperside*: Forewing black distal border very broad, with its inner edge deeply excavated in spaces 2 and 3, sometimes extended narrowly to beyond the middle of hind margin; discocellular spot sometimes appearing; hindwing black distal border very broad, with its inner edge strongly waved. *Underside*: Most markings well developed and distinct; marginal black anticiliary line well developed. **Female** (Pl. 3 (7–8)). *Upperside*: Forewing black distal border very broad, with its inner edge rather distinct, deeply excavated in spaces 2 and 3, sometimes extended narrowly to beyond the middle of basal margin; hindwing black distal border very broad, with its inner edge strongly waved. *Underside*: Most markings well developed; tornal spot present; marginal black anticiliary line well developed.

Forewing length: Male, 23.0–24.0 mm (n=4, avg=23.3 mm), female 18.0–22.0 mm (n=3, avg=20.2 mm).

Material studied: MINDANAO: Todaya, 1 ♀, 26. vii. 1970 (M. Sato); Masara, 1 ♂ 1 ♀, 6–8. ii. 1972 (MIYATA) [KUCGE]. SAMAR: Rawis, 1 ♀, 31. v. 1975 [KUCGE]. LEYTE: Bantawon, St. Brd, 1 ♂ 1 ♀, 21. iii. 1979 (MEDICIELLO); S. Leyte, Catmon, 1 ♂ (ab.?), 28. vi. 1978 (NISHIYAMA) [KUCGE].

Distribution: This subspecies occurs in Mindanao, Dinagat, Leyte and W. Samar.

Eurema sarilata risa MORISHITA, 1981

Eurema sarilata risa MORISHITA, 1981: 5–6., fig. 1, 5–6. Holotype ♂ (Negros). [ET, examined]

This subspecies is distinguishable from the nominate subsp. *sarilata* from Mindanao by the following combination of characters.

Male (Pl. 4 (1–2)). *Upperside*: Forewing black distal border narrower, with concaves in spaces 2 and 3 almost confluent with each other; basal border undeveloped; hindwing black distal border much narrower, with its inner edge almost uniform. *Underside*: Most markings generally fainter; on forewing tornal spot absent; small vein-dots sometimes conjoined with a catenate black anticiliary line. **Female** (Pl. 4 (3–4)). *Upperside*: Forewing black distal border narrower; basal border undeveloped; hindwing black distal border much narrower, with its inner edge more weakly waved; anal border undeveloped; basal portion of both wings almost not black dusted. *Underside*: Most markings somewhat fainter; small vein-dots sometimes conjoined with a catenate black anticiliary line.

Forewing length: Male 20.0–24.0 mm (n=5, avg=21.7 mm), female 19.0–25.0 mm (n=4, avg=22.1 mm).

Type material examined: *Eurema sarilata risa* was described from male and female

specimens by MORISHITA. The holotype male specimen is now in ET and bears the following labels; 'Negros, Amlan, 6. i. 1979 / *Eurema sarilata risa* Morishita, 1981, Holotype ♂ (red)'. The KUCGE and ET also possesses 4 male and 2 females, bearing similar data labels '(Paratype (orange))'.

Material studied: NEGROS: Bals (700 m), 1 ♂ 1 ♀, 5–6. x. 1980, 1 ♂, 21. v. 1981 (TREADAWAY) [TREADAWAY Coll.]. SQUIJOR IS.: Cambandilaan (600 ft), 2 ♂ 2 ♀, 15–21. vi. 1978 (TREADAWAY) [TREADAWAY Coll.].

Distribution: This subspecies occurs in Negros and Siquijor Is.

***Eurema sarilata dayani* SCHROEDER, TREADAWAY & NUYDA, 1990**

Eurema sarilata dayani SCHROEDER, TREADAWAY & NUYDA, 1990: 147–148, fig. 6, ♂ ♀. Holotype ♂ (Sanga Sanga Is., Tawitawi group). [TREADAWAY Coll., not examined]

This subspecies is distinguishable from the nominate subsp. *sarilata* from Mindanao by the following combination of characters.

Male (Pl. 4 (5–6)). *Upperside:* Forewing black distal border much narrower, with concaves in spaces 2 and 3 almost confluent with each other forming a large excavation; basal border undeveloped; hindwing black distal border much narrower, with its inner edge more strongly diffused; anal border undeveloped. *Underside:* Markings much fainter; forewing apical quadrate patch smaller and tornal spot absent. **Female** (Pl. 4 (7–8)). *Upperside:* Forewing black distal border narrower, with concaves in spaces 2 and 3 almost confluent with each other; basal border undeveloped; hindwing black distal border very narrow, with its inner edge more weakly waved; anal border undeveloped; basal portions of both wings almost not black dusted. *Underside:* Most markings fainter; forewing apical quadrate patch smaller and tornal spot absent; hindwing with black marginal line barely traceable.

Forewing length: Male 17–20 mm (n=9), female 18–21 mm (n=8).

According to the original description, this subspecies is distinguishable from *E. sarilata risa* from Negros as follows: 1) Ground colour somewhat paler; 2) Forewing black distal border less inclined towards base near tornus; 3) Forewing underside with apical patch not reaching beyond vein 4, while in *risa* developed along outer margin; 4) hindwing black distal border remarkably narrower.

Type material: *Eurema sarilata dayani* was described from male and female specimens by SCHROEDER, TREADAWAY and NUYDA. Holotype: ♂, Philippinen, Boloboc, 15 m, Sanga Sanga Is., Tawitawi group, C. G. TREADAWAY leg., 8. ii. 1989. [TREADAWAY Coll.]. Paratypes: 4 ♂ sama data as holotype, Th. BORRAMEO leg. 25., 29. vi. 1988; 18. iv. 1989.–2 ♂, 3 ♀, Bongao Is., Bongao Peak, 200 m., C. G. TREADAWAY leg., 24. vi. 1988; 7., 10., 18. ii. 1989.–1 ♂, Tawitawi Is., Luuk Saul, 10 m, C. G. TREADAWAY leg. 21. ii. 1989.–1 ♂, 5 ♀, Sibutu Is., Cavan Cavan, 5 m, C. G. TREADAWAY leg., 27. vi. 1988; 13–15. ii. 1989. [TREADAWAY Coll.].

Distribution: This subspecies is known only from Tawitawi group (Tawitawi, Bongao and Sibutu Isls.).

***Eurema sarilata perplexa* SHIRÔZU & YATA, 1982**

Eurema sarilata bazilana SHIRÔZU & YATA, 1982: 55. (preoccupied by *Eurema alitha bazilana* (FRUHSTORFER, 1900)) Holotype ♂ (Bazilan Is.). [KUFA, examined]

Eurema sarilata perplexa SHIRÔZU & YATA, 1982: 25, nom. nov.

This subspecies is distinguishable from the nominate subsp. *sarilata* from Mindanao by the following combination of characters.

Male (Pl. 5 (1–2)). **Upperside:** Forewing black distal border somewhat narrower; basal border usually more weakly developed; discocellular spots absent; hindwing black distal border somewhat narrower, with its inner edge more regularly waved. **Underside:** Most markings much fainter; on forewing tornal spot absent; marginal black anteciliary line somewhat narrower. **Female** (Pl. 5 (3–4)). **Upperside:** Forewing black distal border somewhat narrower; basal border undeveloped; hindwing black distal border narrower, with its inner edge more weakly waved; anal border undeveloped; basal portions of both wings almost not black dusted. **Underside:** Most markings somewhat fainter; tornal spot absent; marginal black anteciliary line somewhat narrower.

Forewing length: Male, 21.0–22.0 mm (n=4, avg=21.4 mm), female 21.0–23.0 mm (n=2, avg=22.0 mm).

Type material examined: *Eurema sarilata perplexa* was described from male and female specimens by SHIRÔZU and YATA. The holotype male specimen is now in KUFA and bears the following labels; 'Bazilan Is., Maloong, 16. vii. 1931 / *Eurema sarilata bazilana* Shirôzu & Yata, 1982 Holotype ♂ (red) / *Eurema sarilata perplexa* Shirôzu & Yata, 1982 Holotype ♂ (red) / Property of Kyushu University, Faculty of Agriculture'. The KUFA also possesses 3 males and 2 females, bearing similar data labels '(Paratype (orange))'.

Distribution: This subspecies occurs in Bazilan Is.

***Eurema sarilata boholensis* M. & T. OKANO, 1990**

Eurema sarilata sarilata M. & T. OKANO, 1988: 107, pl. 5, fig. 8, pl. 6, fig. 8, ♀. (Bohol) (part.)

Eurema sarilata boholensis M. & T. OKANO, 1990: 1–2, Pl. 1. Holotype ♂ (Bohol Is.). [Okano Coll., not examined]

This subspecies is distinguishable from the nominate subsp. *sarilata* from Mindanao by the following combination of characters.

Male. **Upperside:** Forewing black distal border somewhat narrower; basal border more weakly developed; hindwing black distal border narrower. **Underside:**

Most markings much fainter; on forewing ternal spot absent; small vein-dots sometimes conjoined with a catenate black anteciliary line. **Female.** *Upperside:* Forewing black distal border narrower; basal border barely traceable; hindwing black distal border much narrower, with its inner edge more strongly waved and much diffused; anal border undeveloped; basal portions of both wings almost not black dusted. *Underside:* Most markings fainter; marginal black line much narrower.

Forewing length: Male 18.0–24.0 mm, female 19.0–24.0 mm.

Type material: *Eurema sarilata boholensis* was described from male and female specimens by M. & T. OKANO. The holotype male specimen is now in OKANO Coll. and bears the following labels; 'Bilar, Bohol Is. ix. 1989 / *Eurema sarilata boholensis* M. & T. Okano, 1990, Holotype ♂ (red)'. Okano Coll. also possesses 10 male and 4 female specimens, bearing similar data labels 'Corella, Bohol Is., 1 ♀, vi-vii. 1987. 1 ♀, ii. 1989, 1 ♂, i. 1990; Loboc-Bailar, Bohol Is., 1 ♂ 1 ♀, iv. 1989; Bilar, Bohol Is., 2 ♂, xii. 1988, 1 ♂ 1 ♀, iv. 1989, 3 ♂, ii-iii. 1990 (Paratype (orange))'.

Distribution: This subspecies occurs only in Bohol Is.

***Eurema sarilata rosario* SCHROEDER, TREADAWAY & NUYDA, 1990**

Eurema sarilata rosario SCHROEDER, TREADAWAY & NUYDA, 1990: 144, 146, fig. 5, ♂ ♀. Holotype ♂ (E. Samar). [TREADAWAY Coll., not examined]

This subspecies is distinguishable from the nominate subsp. *sarilata* from Mindanao by the following combination of characters.

Male (Pl. 5 (7)). *Upperside:* Forewing black distal border much broader, as a result occupying distal half of forewing, with its inner edge much diffused and narrowly extended to the middle of hind margin; an isolated ovate black spot appearing at anterodistal portion in forewing cell. *Underside:* Most markings generally fainter; ternal spot barely traceable. **Female** (Pl. 5 (5–6, 8)). *Upperside:* Forewing black distal border sometimes much broader, with its inner edge sometimes narrowly extended into the middle of discoidal cell and also nearly to the base of wing in space 1b+c, as a result anchor-like yellow marking appearing at basal portion of forewing. *Underside:* Most markings generally fainter; ternal spot barely traceable.

Forewing length: Male 15–20 mm (n=25), female 18–21 mm (n=12).

Type material: *Eurema sarilata rosario* was described from male and female specimens from 'Eastern Samar Province' by SCHROEDER, *et al.* Holotype: ♂, Philippines, Eastern Samar Province, 20 m, C. G. TREADAWAY leg., 21. v. 1988. [Treadaway Coll.] Paratypes: 24 ♂, 12 ♀, same data as holotype, C. G. TREADAWAY and Th. Borromeo leg., 15–24. v. 1988. [TREADAWAY Coll.]

Distribution: This subspecies occurs in Eastern Samar Province.

Eurema sarilata mindorana (BUTLER, 1898)

Terias mindorana BUTLER, 1898: 73–74. LECTOTYPE ♀ (Mindoro Is.) here designated. [BMNH, examined]

Eurema sari mindorana (BUTLER); CORBET & PENDLEBURY, 1932: 187.

Eurema sarilata mindorana (BUTLER); HOLLOWAY, 1973: 149.

This subspecies is distinguishable from the nominate subsp. *sarilata* from Mindanao by the following combination of characters.

Male (Pl. 6 (5–6)). *Upperside*: Forewing black distal border sometimes broader, with its inner edge sometimes much diffused and narrowly extended to the middle of basal margin in spaces 1a and 1b+c; hindwing black distal border sometimes somewhat broader, with its inner edge more strongly diffused; basal portions of both wings more strongly blackish. *Underside*: Most markings much fainter; marginal black anticiliary line narrower. **Female** (Pls. 6 (7–8), 7 (1–2)). *Upperside*: Forewing black distal border broader, with its inner edge much diffused and narrowly extended towards base in spaces 1a and 1b+c; discocellular spot sometimes well developed; hindwing black distal border somewhat broader, with its inner edge more strongly diffused; basal portions of both wings more extensively diffused. *Underside*: Most markings much fainter; marginal black anticiliary line narrower.

Forewing length: Male 24.0–24.5 mm (n=3, avg=24.2 mm), female 23.0 mm.

Type material examined: *Terias mindorana* was described from two female specimens from 'Mindoro Is.' by BUTLER. The BMNH now possesses a female specimen, which bears the labels: 'Type (red) / Mindoro, Philippine Is., Dr. Platen. / Godman-Salvin Coll. 96–12.'. In addition the female bears the following labels: 'Lectotype (purple) / *Terias mindorana* Butler LECTOTYPE det. O. Yata 1990' and hereby designated lectotype.

Material studied: MINDORO: Oriental Mindoro, Pueruto-Galera water fall, 2 ♂ 1 ♀, 10. ix. 1976 (KASHIWAI); Pinamalayan, 1 ♂, iii. 1981 [KUCGE].

Distribution: This subspecies occurs only in Mindoro Is.

Eurema sarilata sibuyanensis YATA & TREADAWAY, 1982

Eurema sarilata sibuyanensis YATA & TREADAWAY, 1982: 26–28. Holotype ♂ (Sibuyan Is.). [TREADAWAY Coll., examined]

This subspecies is distinguishable from the nominate subsp. *sarilata* from Mindanao by the following combination of characters.

Male (Pl. 7 (3–6)). *Upperside*: Forewing black distal border much narrower, with concaves in spaces 2 and 3 almost confluent with each other forming a large excavation; basal border undeveloped; hindwing black distal border much narrower, with its inner edge almost uniform; anal border undeveloped. *Underside*: Most markings generally fainter; forewing apical quadrate patch smaller and tornal spot

absent. **Female** (Pl. 7 (7–8)). *Upperside*: Forewing black distal border narrower, with concaves in spaces 2 and 3 almost confluent with each other; basal border undeveloped; hindwing black distal border much narrower, with its inner edge more weakly waved; anal border undeveloped; basal portions of both wings almost not black dusted. *Underside*: Most markings much fainter, especially in forewing cell and discocellular spots; forewing apical quadrate patch smaller and tornal spot absent; small vein-dots sometimes conjoined with a catenate black anticiliary line.

Forewing length: Male 19.0–23.5 mm (n=11, avg=21.7 mm), female 20.0–24.0 mm (n=5, avg=22.1 mm).

This subspecies most closely resembles *E. sarilata risa* from Negros, but is distinguishable from the latter by narrower black distal border, especially in the forewing, with concaves in spaces 2 and 3 almost confluent with each other forming a large excavation, and much reduced apical patch on forewing underside.

Type material examined: *Eurema sarilata sibuyanensis* was described from male and female specimens by YATA and TREADAWAY. The holotype male specimen is now in TREADAWAY Coll. and bears the following labels; 'SIBUYAN IS. Mt. Sibuyan, 13. ii. 1978, Treadaway Coll. / *Eurema sarilata sibuyanensis* Yata & Treadaway, 1982, Holotype (red)'. The TREADAWAY Coll., KMNH, and KUCGE also possesses 10 males and 5 females, bearing similar data labels: 'Sibuyan Is., Mt. Calhoon, 3 ♂, 5–14. v. 1978; Magdiwang, Mt. Guiting-Guiting, 1 ♂, 18. ii. 1978, 1 ♀, 9. ix. 1980 (KMNH IR 100, 314–315), 3 ♂4 ♀, 7–10. ix. 1980; Mt. Sibuyan, 3 ♂1 ♀, 11. ix. 1980, TREADAWAY Coll. (Paratype (orange))'.

Distribution: This subspecies is known only from Sibuyan Is.

Eurema sarilata aquilo SHIRÔZU & YATA, 1982

Eurema sarilata luzonensis SHIRÔZU & YATA, 1982: 54–55. (preoccupied by *Eurema hecabe luzoniensis* (LINNAEUS, 1764)) Holotype ♂ (Luzon). [KUCGE, examined]

Eurema sarilata aquilo Shirôzu & YATA, 1982: 25, nom. nov.

This subspecies is distinguishable from the nominate subsp. *sarilata* from Mindanao by the following combination of characters.

Male (Pl. 6 (1–2)) *Upperside*: Forewing black distal border narrower; basal border undeveloped; discocellular spot absent; hindwing black distal border much narrower, with its inner edge more regularly waved. *Underside*: Most markings fainter; on forewing tornal spot usually absent; small vein-dots usually conjoined with a catenate black anticiliary line. **Female** (Pl. 6 (3–4)). *Upperside*: Forewing black distal border narrower; basal border undeveloped; hindwing black distal border narrower, with its inner edge more distinctly waved; anal border undeveloped; basal portions of both wings more weakly black dusted. *Variation*: In three specimens examined (2 ♂1 ♀) from Marinduque Is. the black distal borders of both wings are

broad than in those from Luzon. In appearance, the individuals from Marinduque Is. are very similar to subsp. *boholensis*.

Forewing length: Male 17.0–24.5 mm (n=10, avg=21.5 mm), female 20.5–21.0 mm (n=2, avg=20.8 mm).

Type material examined: *Eurema sarilata aquilo* was described from male and female specimens by SHIRÔZU and YATA. The holotype male specimen is now in KUCGE and bears the following labels; 'Luzon, Pagsahan, 1 ♂, 14. iii. 1970, A. Miyata leg. / *sarilata luzonensis* Shirôzu & Yata, 1981, Holotype ♂ (red) / *Eurema sarilata aquilo* Shirôzu & Yata, 1982: 25. nom. nov.' The KUCGE also possesses 8 males and 3 females, bearing similar data labels 'Luzon, Pagsahan, 1 ♂, 14. iii. 1970 (A. Miyata); Mt. Maquiling, 1 ♀, 9. v. 1973, 2 ♀, 10. vii. 1973 (H. Fukuda), 1 ♂, 21. viii. 1978 (Nakanishi & Yata) (KMNH IR 100,316), 6 ♂, 10–26. viii. 1978 (NAKANISHI & YATA) (Paratype (orange))'.

Material studied: MARINDUQUE IS.: 3 ♂ 1 ♀, 23. x. 1975 (M. NAKAYAMA) [KUCGE].

Distribution: This subspecies occurs in Luzon and Marinduque Is.

The *candida* subgroup

Eurema candida (CRAMER, [1782])

[Pls. 8–13]

Papilio candida CRAMER, [1782]: 82, pl. 331, fig. A. (Amboina)

?*Papilio flavotinctus* GOEZE, 1779: 181.

?*Papilio nigricanteinfinitatus* GOEZE, 1779: 184.

Terias candida (CRAMER); LUCAS, 1835: 75, pl. 38, fig. 3.

Terias virgo WALLACE, 1867: 328. (Aru)

Terias xanthomelaena GODMAN & SALVIN, 1879: 159. (New Ireland)

Terias puella BUTLER (nec BOISDUVAL), 1884: 196. (Ternate)

Terias woodfordi BUTLER, 1898: 61. (Aola, Guadalcanar)

Terias salomonis BUTLER, 1898: 61. (Fauro Isls.)

Terias talboti HULSTAERT, 1923: 228. (Watuvar, Key Isls.)

Eurema candida (CRAMER); CORBET & PENDLEBURY, 1932: 189.

Diagnosis: Underside of both wings with broad and almost uniform black distal borders; in hindwing black anal border usually present, if absent black distal borders rather narrow; uncal projection broad, V-shaped in posterior aspect.

Description: **Male.** *Upperside:* Ground colour bright yellow. Forewing black costal border fairly broad with its inner margin sharply defined; black distal border generally broad, with its inner edge almost uniform as a whole, somewhat irregular from costa to vein 4, sometimes very weakly concaved in spaces 2 and 3, almost perpendicular to basal margin in spaces 1a and 1b+c; black basal border undeveloped; discocellular spot absent; fringe black. Hindwing black distal border

generally broad, usually tapering near apex and tornus, with its inner edge almost uniform, sometimes very weakly concaved in each space; anal border sometimes well developed, occupying in spaces 1a to 3; fringe black. Basal portions of both wings usually distinctly blackish, especially on forewing. *Underside*: Ground colour slightly paler than on upperside. Forewing with black distal border almost the same as on upperside; usual spotted markings entirely absent; sex-brand light gray to brown, long and narrow, ending slightly before a point of origin of vein 2; fringe black. Hindwing with black distal border almost the same as on upperside, but anal border undeveloped, in spite of presence of anal border on upperside; usual spotted markings entirely absent; fringe black. Ultraviolet reflectance on upperside: Structurally reflective on yellow area except for tornal to anal region of hindwing, but sometimes diffused distally, appearing bright-white to -grey in UV-photos (Pl. 21 (5–6, upper) in Part II).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black, white-checked on ventral surface, club cylindrical. Thorax and abdomen usually almost black, beneath whitish-yellow to yellow, clothed with black hairs, sometimes mixed with yellow ones, on thorax and base of abdomen, a black longitudinal line sometimes appearing along the lateral margin of abdominal terga.

Forewing length: 20.0–28.0 mm.

Female. Similar to male, but differing as follows. *Upperside*: Ground colour usually pure- to milky-white, sometimes entirely pale. Forewing black costal border somewhat narrower, with its inner edge more strongly diffused; black distal border broader, with its inner edge more or less diffused. Hindwing black distal border broader, with its inner edge diffused; anal border broader and more strongly diffused. Basal portions of both wings usually more heavily and extensively black dusted. *Underside*: Ground colour always pale yellow except in spaces 1a and 1b+c on forewing. Ultraviolet reflectance on upperside: Much reflective on ground colour, appearing entirely white or light grey in UV-photos (Pl. 21 (5–6, lower) in Part II).

Forewing length: 19.0–27.0 mm.

Male genitalia (Figs. 5–6): Tegumen narrow, triangular in dorsal aspect, slightly concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus long (0.77 of ring height), angle between vinculum and saccus 80–90°. Uncus long (dorsum proper 0.6–0.8 of ring height), fairly arched dorsally, extending strongly downwards; uncal projection fairly developed (0.1–0.13 of ring height), projecting posterodorsally, with its apex weakly bicuspid. Valva somewhat shorter than high; P1 somewhat weakly sclerotized, much shorter than P4, projecting almost laterally; P2 represented by a spatulate-shaped process producing just before P3; P3 very broad and beak-shaped;

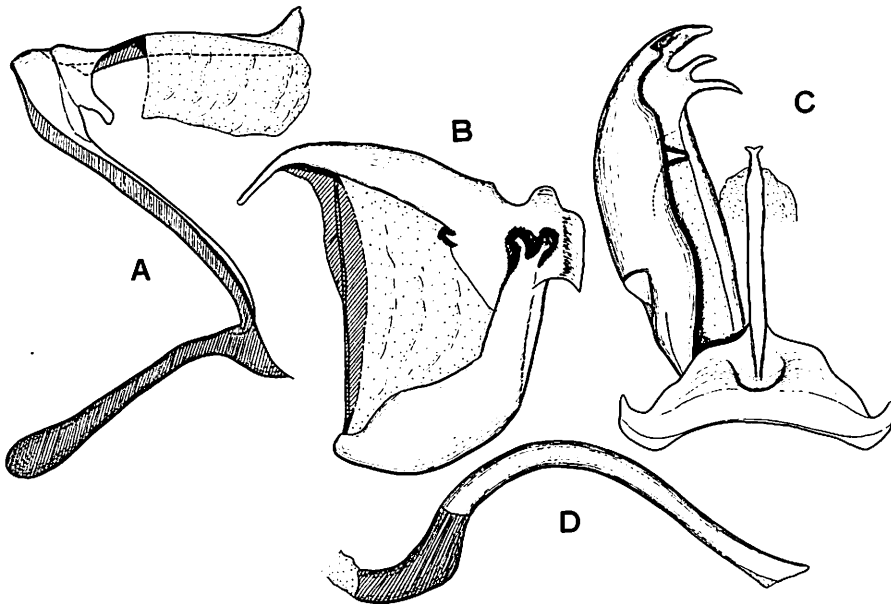


Fig. 5. Male genitalia of *Eurema candida candida* (CRAMER, 1789) from Ambon. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

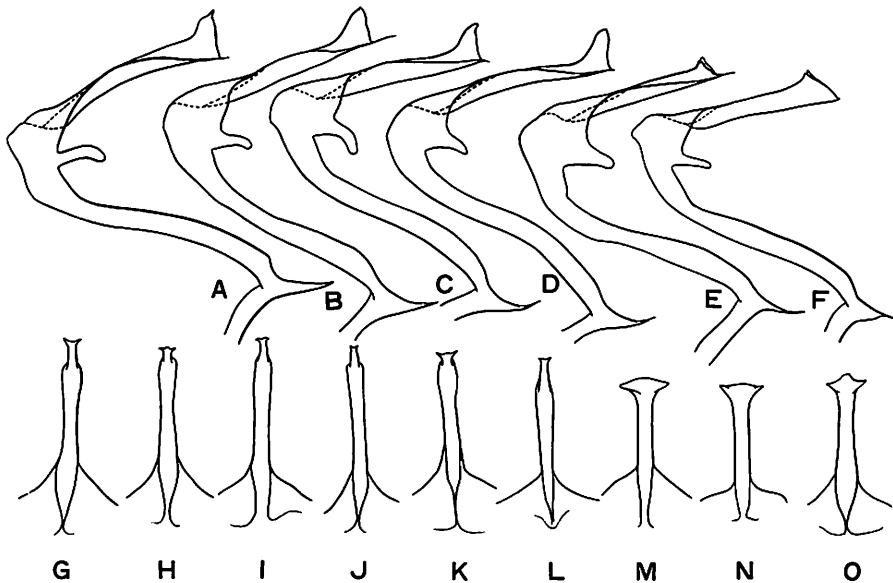


Fig. 6. Male genitalia of *Eurema candida* and *E. puella*. A-F: Rings (lateral); G-O: Unci (dorsal). A-D, G-L: *candida*; E-F, M-O: *puella*. A: Ambon, B: Halmahera, C: New Britain, D: Guadalcanal, E: New Guinea, F: Waigeo, G: Ambon, H: Halmahera, I: Halmahera, J: Guadalcanal, K: New Britain, L: Obi, M: New Guinea, N: Waigeo, O: New Guinea.

P4 represented by two short processes which are almost the same in length and shape, weakly curved ventrally. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as $1/4$ length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

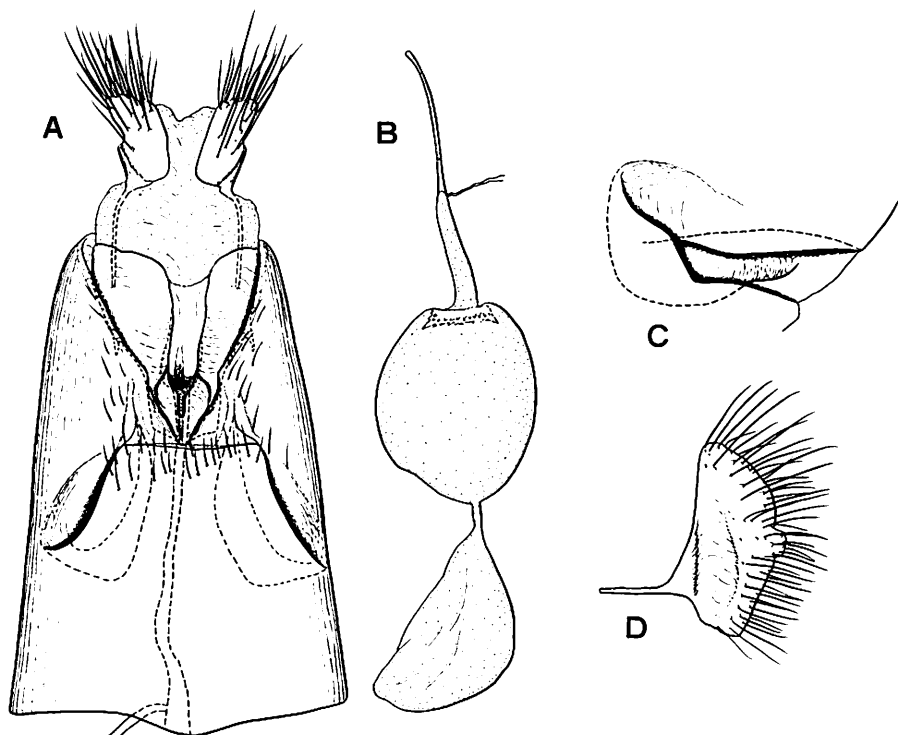


Fig. 7. Female genitalia of *Eurema candida candida* (CRAMER, 1789) from Seram. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Lateral hollow (lateral). D: Papilla analis (lateral).

Female genitalia (Fig. 7): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, fairly expanded posteriorly without dorsal caves, ventral caves long and very deep, median groove long, having a long caves situated ventral $1/2$ of lateral hollow. Genital plate weakly invaginated ventromedially, obtuse-angled on its anterolateral corner in ventral aspect; longitudinal groove weakly sclerotized, broad and deep; banks of longitudinal groove rather developed, with shallow and stippled excavation around ostium bursae. V-shaped wall undeveloped. Ostium bursae opening at the anterior $1/3$ of genital plate. Ductus bursae about 1.3 length of cervix bursae, membranous but weakly sclerotized on anterior $1/5$. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, nearly as long

as apophysis posterioris, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: In contrast to *E. puella*, the present species shows considerable geographical variation in wing markings, especially in the developmental degrees of anal border on hindwing. Seasonal variation is unknown.

Taxonomic remarks: *Eurema puella* has long been considered to be conspecific with the present species. However, I raise *puella* to specific rank here and include subsp. *diotima* and *papuana* from New Guinea, *octogesa* from Waigeo, and *virgo* from Aru in this species based mainly on the male genitalia.

Relationship: This species is closely related to *E. puella* and forms undoubtedly with it a monophyletic group.

Distribution: This species has "disjunct geographic ranges"; it occurs in Moluccas (Halmahera, Bachan, Obi, Ambon, Ceram, Buru, etc.), Timor, Flores, Key, Bismark and Solomon Isls.

Habitat and habits: This butterfly mainly inhabits lowland rain forests, and it is found weakly flying close to the ground in forest edges or paths through forests. This species is multivoltine, and it is found flying all the year round in the subtropical and tropical regions.

Early stages: The early stages are poorly known. According to the colour photograph shown by D'ABRERA (1971), the mature larva (subsp. *xanthomelaena*) resembles that of *E. sarilata* except for a rounded black spot appearing on the anterior margin of 1st abdominal segment along dorsal margin of the white spiracular line.

Eurema candida candida (CRAMER, [1782])

Papilio candida CRAMER, [1782]: 82, pl. 331, fig. A. LECTOTYPE ♂ (Amboina) here designated. [MNHN, examined]

?*Papilio flavotinctus* GOEZE, 1779: 181. (Ambon)?

?*Papilio nigricanteinfinitatus* GOEZE, 1779: 184. (Ambon)?

Terias candida candida (CRAMER); FRUHSTORFER, 1910: 172.

Terias candida f. exalbescens JURRIAANSE, 1926: 67. (Buru)

Eurema candida candida (CRAMER); CORBET & PENDLEBURY, 1932: 189.

The nominate subspecies is characterized by the following combination of characters.

Male (Pl. 8 (1-4)). *Upperside*: Forewing black distal border fairly broad, almost same width from vein 4 to basal margin; hindwing black distal border fairly broad, with its inner edge sometimes weakly waved; anal border well developed from tornus to base, occupying almost in space 1a; basal portions of both wings distinctly blackish. *Underside*: Black distal borders fairly broad. **Female** (Pl. 8 (5-8)). *Upperside*: Forewing black distal border very broad, with its inner edge almost

uniform; hindwing black distal border fairly broad; anal border well developed from tornus to base, occupying almost in spaces 1a to 2 and basal half of discoidal cell; basal portions of both wings extensively black dusted. *Underside*: Forewing costa whitish; black distal border fairly broad.

Forewing length: Male 22.0–25.0 mm (n=4, avg=23.9 mm), female 19.0–25.0 mm (n=8, avg=22.4 mm).

Type material examined: *Papilio candida* was described from an unstated number of male and female specimens from 'Amboina' by CRAMER. The MNHN now possesses 3 male and 1 female specimens (One male of them does not seem to be a specimen from Ambon, though it bears the label of Ambonina). One of the male specimens bears the labels: 'Type (red letter) / Dumour d'Vroille?, Museum de Paris'. In addition the male bears the following labels; 'Lectotype (purple) / *Papilio candida* Cramer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The other male and female specimens bear similar data labels, and in addition the following labels; 'Paralectotype (blue) / *Papilio candida* Cramer PARALECTOTYPE det. O. Yata 1990'.

Material studied: AMBON: 0–150 m, 2 ♂2 ♀, 4–6. xii. 1973 (KANO & SHINONAGA) [KUCGE]. SERAM: Kairatu, 1 ♂, 4–5. xii. 1973 (SHINONAGA); Kamarian, 1 ♂1 ♀, 24. i. 1973 (GUNJI) [KUCGE].

Distribution: This subspecies occurs in S. Moluccas (Ambon, Seram, Buru, Saparua).

Eurema candida libera (FRUHSTORFER, 1910)

Terias candida libera FRUHSTORFER, 1910: 172, t. 73d, ♂, h, ♀ (as *puella*). LECTOTYPE ♂ (Halmaheira) here designated. [BMNH, examined]

Eurema candida libera (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 188.

The subspecies is distinguishable from the nominate subsp. *candida* from Ambon by the following combination of characters.

Male (Pl. 9 (1–4)). *Upperside*: Forewing black distal border narrower, gradually narrowed posteriorly; hindwing black distal border narrower, with its inner edge almost uniform; anal border undeveloped; basal portions of both wings more narrowly blackish. *Underside*: Black distal borders narrower, gradually narrowed posteriorly in fore- and hindwings. Larger in size. **Female** (Pl. 9 (5–8)). *Upperside*: Ground colour milky-white with pale greenish yellow tinge; forewing black distal border narrower, gradually narrowed posteriorly, with its inner edge shallowly excavated between veins 2 and 4, weakly produced at vein 4, hindwing black distal border narrower, tapering posteriorly; anal border undeveloped; basal portions of both wings more weakly black dusted. *Underside*: Forewing costa not whitish; black distal borders of both wings narrower, gradually narrowed posteriorly.

Forewing length: Male 23.0–28.0 mm (n=14, avg=25.7 mm), female 22.0–27.5

mm ($n=9$, avg=24.9 mm).

Type material examined: *Terias candida libera* was described from an unstated number of male and female specimens from 'Halmaheira' by FRUHSTORFER. The BMNH now possesses a male and a female specimens. The female specimen bears the labels: 'Type (red) / Fruhstorfer Coll., B.M. 1937-285'. In addition the female bears the following labels; 'Lectotype (purple) / *Terias candida libera* Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The male specimen bears the labels; 'Batjen, August, H. Fruhstorfer/ libera Fruhst. ? ♂ type; (S.T.), and in addition the following labels; 'Paralectotype (blue) / *Terias libera* Fruhstorfer PARALECTOTYPE det. O. Yata 1990'.

Material studied: HALMAHERA: 1 ♂, 1936 (TANAKA) [SAKAGUCHI Coll.]; Mt. G. Gamkunoro, 1. xi. 1972 (IGARASHI) [IGARASHI Coll.]; Djailolo, 1 ♂ 1 ♀, 23. xii. 1972 (GUNJI) [KUCGE]. TERNATE IS.: 1 ♂, i. 1973, 1 ♀, 8. i. 1973, 1 ♀, 18. xii. 1972 (GUNJI) [KUCGE].

Distribution: This subspecies occurs in N. Moluccas (Halmahera, Ternate and Bachan Isls.).

Eurema candida dindymene (FRUHSTORFER, 1910)

Terias candida dindymene FRUHSTORFER, 1910: 172, t. 73 c, ♀. LECTOTYPE ♀ (Obi) here designated. [BMNH, examined]

Eurema candida dindymene (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 188.

The subspecies is distinguishable from the nominate subsp. *candida* from Ambon by the following combination of characters.

Male (Pl. 10 (1-2)). *Upperside:* Forewing black distal border somewhat narrower, gradually narrowed posteriorly; hindwing black distal border narrower; anal border very extensively developed, almost occupying spaces 1a to 3; basal portions of both wings more broadly blackish and usually also black dusted basal portion of each longitudinal vein. *Underside:* Black distal borders of both wings narrower and gradually narrowed posteriorly. **Female** (Pl. 10 (3-4)). Black distal borders of both wings broader; hindwing anal border usually more extensively black dusted.

Forewing length: Male 20.0-24.0 mm ($n=4$, avg=21.8 mm), female 24.0 mm.

Type material examined: *Terias candida dindymene* was described from an unstated number of female specimens from 'Obi' by FRUHSTORFER. The BMNH now possesses a female specimen which bears the labels: 'Type (red) / Obi, H. Fruhstorfer / Fruhstorfer Coll., B.M. 1937-285'. In addition the female bears the following labels; 'Lectotype (purple) / *Terias candida dindymene* Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype.

Material studied: OBI: 4 ♂, 11-14. vii. 1979 (GUNJI) [KUCGE] [ET].

Distribution: This subspecies is known only from Obi.

***Eurema candida goramensis* (FRUHSTORFER, 1910)**

Terias candida goramensis FRUHSTORFER, 1910: 172. (Goram) [untraced]

Eurema candida goramensis (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 189.

I have not seen any specimens of this subspecies. According to the original description, the black distal borders of both wings are much narrower than those of subsp. *candida*, and subsp. *goramensis* forms a transition to subsp. *virgo*.

Distribution: This subspecies occurs only in Goram Is., southeast of Seram.

***Eurema candida micromalayana* (FRUHSTORFER, 1910)**

Terias candida micromalayana FRUHSTORFER, 1910: 172. LECTOTYPE ♂ (Flores & Timor) here designated. [BMNH, examined]

Eurema candida micromalayana (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 189.

According to the type specimen of BMNH, the subspecies is quite similar to the nominate subsp. *candida* from Ambon, but may be distinguishable from the latter by the slightly broader black distal borders of both wings in male (Pl. 10 (5–6)). However, a male and a female specimens from Timor in the MNHN have narrower black distal borders of both wings than that of the nominate subspecies (Pl. 10 (7–8)).

Forewing length: Male 28.0 mm.

Type material examined: *Terias candida micromalayana* was described from an un-stated number of male specimens from 'Flores, Maumerie' by FRUHSTORFER. The BMNH now possesses a male specimen which bears the following labels: 'Type (red) / *candida micromalayana* Ft. / Maumerie / Fruhstorfer Coll., B.M. 1937–285'. In addition the male bears the following labels; 'Lectotype (purple) / *Terias candida micromalayana* Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype.

Distribution: This subspecies is known only from Flores and Timor.

***Eurema candida talboti* (HULSTAERT, 1923)**

Terias talboti HULSTAERT, 1923: 228. (Key Isls.) [untraced]

Eurema candida talboti (HULSTAERT); CORBET & PENDLEBURY, 1932: 189.

Terias candida talboti HULSTAERT; TALBOT, 1935: 577.

The subspecies is distinguishable from the nominate subsp. *candida* from Ambon by the following combination of characters.

Male (Pl. 11 (5–6)). **Upperside:** Forewing black distal border somewhat broadened towards apex, with its inner edge weakly excavated in spaces 2 and 3. **Underside:** Forewing black distal border somewhat broadened towards apex. Fore-

wing apex more strongly angulate. **Female** (Pl. 11 (7–8)). *Upperside*: Forewing black distal border somewhat broadened towards apex, with its inner edge weakly excavated in spaces 2 and 3. *Underside*: Forewing black distal border somewhat broadened towards apex. Forewing apex more strongly angulate.

Forewing length: Male 20.0–24.5 mm (n=2, avg=22.3 mm), female 24.5.

Material studied: KEY ISLS.: G. Key, Watuar?, 1 ♂, Jan–March, 1896, 1 ♀, iv. 1896 (Crowly BEQUEST) [1901–78]; Ki Isls, viii. 1909 (W. STALKER) [1910–127].

Distribution: This subspecies is known only from Key Is.

***Eurema candida xanthomelaena* (GODMAN & SALVIN, 1879)**

Terias xanthomelaena GODMAN & SALVIN, 1879: 159. LECTOTYPE ♂ (New Ireland) here designated. [BMNH, examined]

Terias candida xanthomelaena GODMAN & SALVIN; FRUHSTORFER, 1910: 172.

?*Terias candida digentia* FRUHSTORFER, 1910: 172.

Eurema candida xanthomelaena (GODMAN & SALVIN); CORBET & PENDLEBURY, 1932: 190.

The subspecies is distinguishable from the nominate subsp. *candida* from Ambon by the following combination of characters.

Male (Pl. 12 (1–2)). *Upperside*: Forewing black distal border somewhat narrower, gradually narrowed posteriorly; hindwing black distal border narrower; anal border well developed, almost occupying spaces 1a and 1b+c; basal portions of both wings more broadly blackish. *Underside*: Black distal borders of both wings narrower and gradually narrowed posteriorly. **Female** (Pl. 12 (3–6)). *Upperside*: Forewing black costal border broader; black distal border narrower, narrowed posteriorly; hindwing black distal border narrower; anal border much more strongly and extensively black dusted, occupying almost in spaces 1a to 4; basal portions of both wings extensively black dusted, occupying basal half of forewing cell and whole of hindwing one. *Underside*: Forewing costa not whitish; black distal borders narrower, narrowed posteriorly.

Forewing length: Male 20.0–22.0 mm (n=2, avg=21.9 mm), female 20.5–22.5 mm (n=3, avg=21.7 mm).

Type material examined: *Terias xanthomelaena* was described from an unstated number of male and female specimens from 'New Ireland' by GODMAN & SALVIN. The BMNH now possesses a male and female specimens. The male specimen bears the labels: 'Type (red) / New Ireland, Rev. G. Brown / Godman & Salvin Coll. 96.–12. / xanthomelanena G. & S.' In addition the male bears the following labels; 'Lectotype (purple) / *Terias xanthomelaena* Godman & Salvin LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels, and in addition the following labels; 'Paralectotype (blue) / *Terias xanthomelaena* Godman & Salvin PARALECTOTYPE det. O. Yata 1990'.

Material studied: NEW BRITAIN: Rabaul, 1 ♂, 9. i. 1971; 2 ♀, 7. i. 1971

(SHINKAWA); Rabaul, Keravat, 1 ♂ 1 ♀, 22–27. i. 1974 (H. SHIMA) [KUCGE].

Distribution: This subspecies occurs in Bismark Isls.

***Eurema candida woodfordi* (BUTLER, 1898)**

Terias woodfordi BUTLER, 1898: 61. LECTOTYPE ♂ (Aola, Guadalcanar) here designated. [BMNH, examined]

Terias puella var. *salomonis* RIBBE, 1898: 86.

Terias candida woodfordi BUTLER; FRUHSTORFER, 1910: 172.

Eurema candida woodfordi (BUTLER); CORBET & PENDLEBURY, 1932: 190.

The subspecies is distinguishable from the nominate subsp. *candida* from Ambon by the following combination of characters.

Male (Pls. 12 (7–8), 13 (1–2)). *Upperside:* Forewing black distal border somewhat broadened towards apex; hindwing black distal border narrower, tapering towards tornus; anal border undeveloped; basal portions of both wings much more narrowly and weakly blackish. *Underside:* Forewing black distal border somewhat broadened towards apex; hindwing black distal border narrower, tapering towards tornus. **Female** (Pl. 13 (3–4)). *Upperside:* Ground colour pale yellow, sometimes with greenish yellow tinge. Forewing black distal border somewhat broadened towards apex; hindwing black distal border narrower, tapering towards tornus; anal border undeveloped; basal portions of both wings much more narrowly and weakly blackish. *Underside:* Forewing black distal border somewhat broadened towards apex; hindwing black distal border narrower, tapering towards tornus.

Forewing length: Male 22.0–24.0 mm (n=3, avg=22.8 mm), female 24.0–25.5 mm (n=3, avg=24.7 mm).

Type material examined: *Terias woodfordi* was described from an unstated number of male and female specimens from 'Guadalcanar' by BUTLER. The BMNH now possesses a male and a female specimens. The male specimen bears the labels: 'Type (red) / Aola, Guadalcanar I., Solomon Is., Woodford. / Godman & Salvin Coll. 96–12./ *Terias woodfordi*, type Butler'. In addition the male bears the following labels; 'Lectotype (purple) / *Terias woodfordi* Butler LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels (*Terias woodfordi* ♀ Butler), and in addition the following labels; 'Paralectotype (blue) / *Terias woodfordi* ♀ Butler PARALECTOTYPE det. O. Yata 1990'.

Material studied: SOLOMON ISLS.: Santa Isabel Is., 2 ♂ 3 ♀, ii–iii. 1972 (NAKAYAMA) [KUCGE]; Guadalcanal Is., 1 ♂, 21. ix. 1958 (T. TOKIOKA) [OMNH].

Distribution: This subspecies occurs only in Solomon Isls.

***Eurema puella* (BOISDUVAL, 1832)**

[Pls. 11, 13–15]

Xanthidia puella BOISDUVAL, 1832: 60, pl. 2, fig. 8. (Dutch New Guinea)*Terias papuana* BUTLER, 1898: 60. (Port Moresby)

Diagnosis: Underside of both wings with broad and almost uniform black distal borders; in hindwing black anal border always absent and black distal borders usually broad; uncal projection narrow, almost triangular in posterior aspect.

Description: Male. *Upperside:* Ground colour bright yellow. Forewing black costal border fairly broad with its inner margin sharply defined; black distal border generally broad, especially near apex, with its inner edge sharply defined and almost uniform as a whole, somewhat irregular from costa to vein 4, sometimes very weakly concaved in spaces 2 and 3, almost perpendicular to basal margin in spaces 1a and 1b+c; black basal border undeveloped; discocellular spot absent; fringe black. Hindwing black distal border generally broad, usually tapering near apex and tornus, with its inner edge almost uniform, but usually very weakly concaved in each space; anal border undeveloped; fringe black. Basal portions of both wings narrowly blackish, especially on forewing. *Underside:* Ground colour slightly paler than on upperside. Forewing with black distal border almost the same as on upperside; spotted marking entirely absent; sex-brand pale brown, long and narrow, ending slightly before a point of origin of vein 2; fringe black. Hindwing with black distal border almost the same as on upperside; spotted markings entirely absent; fringe black. Ultraviolet reflectance on upperside: Structurally reflective on yellow area except for tornal to anal region of hindwing, appearing bright grey in UV-photos (Pl. 21 (7, upper) in Part II).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black, white-checked on ventral surface, club cylindrical. Thorax and abdomen usually yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal line sometimes appearing along the lateral margin of abdominal terga.

Forewing length: 18.5–25.0 mm.

Female. Similar to male, but differing as follows. *Upperside:* Ground colour usually pure-white. Forewing black costal border narrower, with its inner edge somewhat diffused; black distal border somewhat broader, with its inner edge more or less diffused. Hindwing black distal border sometimes broader, with its inner edge slightly diffused; anal border undeveloped. *Underside:* Ground colour always pale yellow except in spaces 1a and 1b+c on forewing. Ultraviolet reflectance on upperside: Much reflective on ground colour, appearing entirely white in UV-photos (Pl. 21 (7, lower) in Part II).

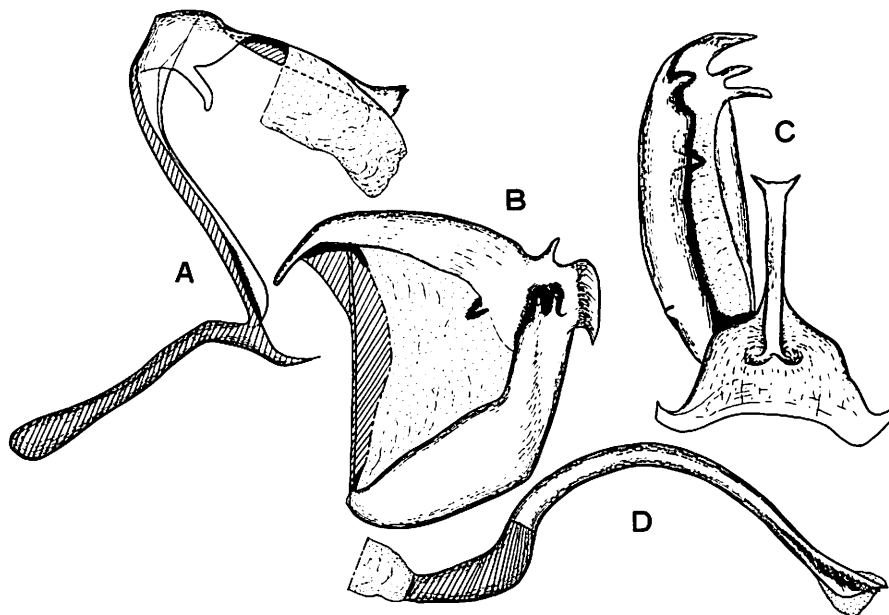


Fig. 8. Male genitalia of *Eurema puella puella* (BOISDUVAL, 1832) from Papua New Guinea.

A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

Forewing length: 18.0–24.0 mm.

Male genitalia (Figs. 6, 8): Tegumen narrow, triangular in dorsal aspect, slightly concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus long (0.79 of ring height), angle between vinculum and saccus 80–90°. Uncus moderately long (dorsum proper 0.72–0.74 of ring height), slightly arched dorsally, extending strongly downwards; uncal projection broad (0.1–0.15 of ring height) and its apex strongly bicuspid, V-shaped in posterior aspect, projecting posterodorsally, with its apex weakly bicuspid. Valva almost as long as high; P1 somewhat weakly sclerotized, slightly shorter but broader than P4, projecting almost laterally; P2 narrow with its apex pointed; P3 very broad and beak-shaped; P4 represented by two short processes which are almost the same in length and shape, weakly curved ventrally. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as 1/4 length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 9): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, fairly expanded posteriorly without dorsal caves, ventral caves long and very deep, median groove short, having a short caves situated ventral 1/2 of lateral hollow. Genital plate weakly invaginated

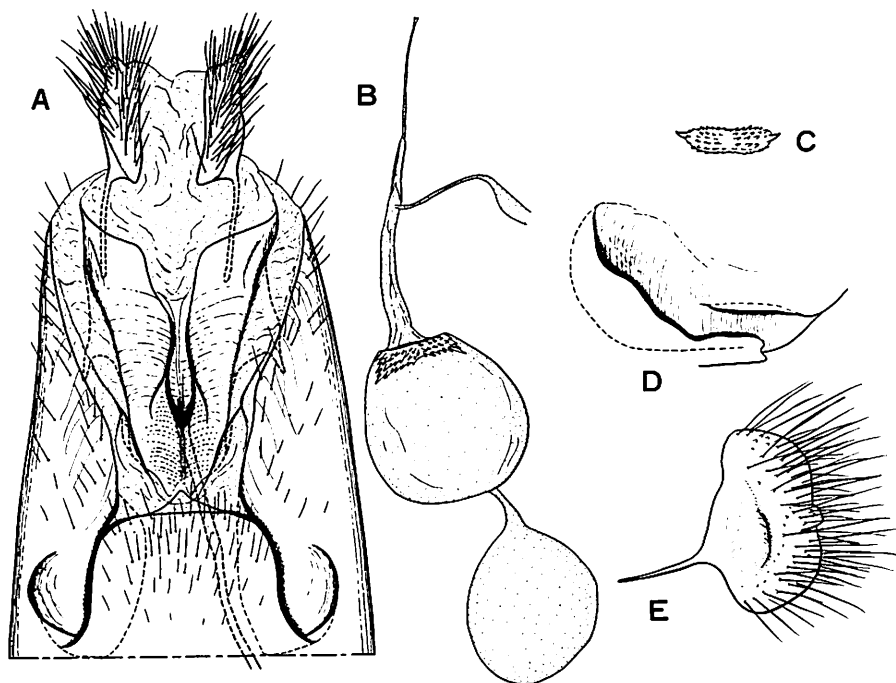


Fig. 9. Female genitalia of *Eurema puella puella* (BOISDUVAL, 1832) from Papua New Guinea.
 A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Signum (anterior).
 D: Lateral hollow (lateral). E: Papilla analis (lateral).

ventromedially, obtuse-angled on its anterolateral corner in ventral aspect; longitudinal groove weakly sclerotized, broad and deep, but somewhat narrowed medially; banks of longitudinal groove rather developed, distinctly stippled around ostium bursae. V-shaped wall undeveloped. Ostium bursae opening at the anterior 1/3 of genital plate. Ductus bursae about the length of cervix bursae, membranous but weakly sclerotized on anterior 1/4. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, nearly as long as apophysis posterioris, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: In contrast to *E. candida* the present species shows little geographical variation in wing markings. Seasonal variation is unknown.

Taxonomic remarks: This species had long been considered as conspecific with *E. candida*. However, I raise *puella* to specific rank here and include subsp. *diotima* and *papuana* from New Guinea, and subsp. *octogesa* from Waigeo Is. in *E. candida* based mainly on the male genitalia.

Relationship: This species is closely related to *E. candida* and forms undoubtedly

with it a monophyletic group (the *candida* subgroup).

Distribution: This species occurs in West Irian and its neighboring Isls. (Misol, Waigeo, Schouten and Biak Isls.), Papua New Guinea and Queensland.

Habitat and habits: This butterfly mainly inhabits lowland rain forests, and it is found weakly flying close to the ground along forest edges or paths through forests. This species is multivoltine, and it is found flying all the year round in the subtropical and tropical regions.

Early stages: The early stages are unknown.

Eurema puella puella (BOISDUVAL, 1832)

Xanthidia puella BOISDUVAL, 1832: 60, pl. 2, fig. 8. (Dutch New Guinea) [untraced]

Terias candida puella (BOISDUVAL); FRUHSTORFER, 1910: 172.

Eurema candida puella (BOISDUVAL); CORBET & PENDLEBURY, 1932: 190.

The nominate subspecies is distinguishable from other subspecies by the following combination of characters.

Male (Pl. 13 (5–6)). **Upperside:** Forewing black distal border fairly broad, gradually narrowed posteriorly, with its inner edge shallowly but distinctly concaved in spaces 2 and 3; hindwing black distal border fairly broad, with its inner edge sometimes weakly waved. **Underside:** Black distal borders fairly broad. **Female** (Pl. 13 (7–8)). **Upperside:** Ground colour pure-white. Black distal borders of upper and undersides fairly broad.

Forewing length: Male 22.0–24.0 mm (n=6, avg=23.3 mm), female 22.0–24.0 mm (n=5, avg=22.8 mm).

Material studied: NEW GUINEA: W. Irian, Manokuwari, 1 ♀, 15. ii. 1918, 1 ♂, 3. v. 1918; Waoboë, 1 ♂ 2 ♀, 5. xi. 1918; Wati, 1 ♂, 5. ii. 1918 (NIIMURA) [NSA]; Bartle Bay, 2 ♂, 13. viii. 1939 (P. JACOULET); Arfak, 1 ♂ 1 ♀, xii. 1979 (NAKAYAMA); Sorong, 1 ♀, 16. ii. 1973 (GUNJI) [KUCGE].

Distribution: This species is known from West Irian (Dorey, Manokwari to Humboldt Bay, Etna Bay and Merauke).

Eurema puella octogesa (FRUHSTORFER, 1910)

Terias candida octogesa FRUHSTORFER, 1910: 172. LECTOTYPE ♂ (Waigeu) here designated. [BMNH, examined]

Terias candida octogesa f. *biakensis* JOICEY & TALBOT: 218. (Biak) [BMNH, Holotype ♀, examined]

Eurema candida octogesa (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 189.

The subspecies is distinguishable from the nominate subsp. *puella* from Manokwari by the following combination of characters.

Male (Pl. 14 (1–4)). **Upperside:** Forewing black distal borders narrower; hind-

wing black distal border narrower, tapering posteriorly. *Underside*: Black distal borders narrower, gradually narrowed posteriorly. **Female** (Pl. 14 (5–8)). *Upperside*: Ground colour pure-white with lemon-yellow tinge or “darker yellow” (specimens from Biak Is. (CORBET & PENDLEBURY, 1932)). Black distal borders of both wings rather narrower. *Underside*: Black distal borders of both wings rather narrower.

Forewing length: Male 18.5–22.5 mm (n=4, avg=20.8 mm), female 24.0 mm.

Type material examined: *Terias candida octogesa* was described from an unstated number of male and female specimens from ‘Waigiu’ by FRUHSTORFER. The BMNH now possesses a male and female specimens. The male specimen bears the labels: ‘Type (red) / Waigiu, H. Fruhstorfer / candida octogesa Fruhst. / Fruhstorfer Coll., B.M. 1937–285.’ In addition the male bears the following labels; ‘Lectotype (purple) / *Terias candida octogesa* Fruhstorfer LECTOTYPE det. O. Yata 1990’ and hereby designated lectotype. The female specimen bears similar data labels, and in addition the following labels; ‘Paralectotype (blue) / *Terias candida octogesa* Fruhstorfer PARALECTOTYPE det. O. Yata 1990’.

Material studied: WAIGEO: Sapokren, 2♂, 8–11. 1973 (Gunji) [KUCGE]. BIAK IS.: Mara, 2♂, 20–23. i. 1983 [ET].

Distribution: This subspecies occurs in Waigeo, Schouten and Biak Isls.

Eurema puella diotima (FRUHSTORFER, 1910)

Terias puella diotima FRUHSTORFER, 1910: 172. (German New Guinea & Vulcan Is.) [untraced]

Eurema candida diotima (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 190.

Terias candida diotima FRUHSTORFER; TALBOT, 1935: 578.

The subspecies is distinguishable from the nominate subsp. *puella* from West Irian by the following combination of characters.

Male. *Upperside*: Ground colour somewhat paler; forewing black distal border narrower, with its inner edge almost uniform; hindwing black distal border narrower, tapering posteriorly, with its inner edge almost uniform. *Underside*: Black distal borders narrower, tapering posteriorly. **Female.** Black distal borders on upper and underside generally somewhat narrower.

Forewing length: Male 20.0–25.0 mm (n=7, avg=22.4 mm), female 20.5–22.5 mm (n=4, avg=21.3 mm).

Material studied: NEW GUINEA: N. E. Papua New Guinea, Madang, 1♂, 10. xii. 1973 (SUEFUJI); Gogol River, 50 km from Madang, 1♂, 5–6. ii. 1985 (K. MORIMOTO) [KUFA]; Lac, 1♂, 19. i. 1974 (SHINONAGA); 2♂, 26–27. xii. 1970 (SHINKAWA), Bumbu R., 1♂2♀, 12. xii. 1973, 1♂2♀, 25. xii. 1973 [KUCGE].

Distribution: This subspecies occurs in N. E. Papua New Guinea (Madang, Lac and Vulcan Is.).

Eurema puella papuana (BUTLER, 1898)

Terias papuana BUTLER, 1898: 60. LECTOTYPE ♂ (Misol, Port Moresby) here designated. [BMNH, examined]

Terias candida papuan FRUHSTORFER, 1910: 172.

Eurema candida papuana (BUTLER); CORBET & PENDLEBURY, 1932: 190.

The subspecies is distinguishable from the nominate subsp. *puella* from West Irian by the following combination of characters.

Male (Pl. 15 (1–4)). *Upperside*: Forewing black distal border slightly broader, especially near apex, with its inner edge almost uniform; hindwing black distal border sometimes slightly broader. *Underside*: Black distal borders slightly broader. **Female** (Pl. 15 (5–8)). Black distal borders of upper and undersides broader.

Forewing length: Male 22.0–24.0 mm (n=3, avg=23.0 mm), female 18.0–22.5 mm (n=2, avg=20.3 mm).

Type material examined: *Terias papuana* was described from an unstated number of male and female specimens from 'Port Moresby' by BUTLER. The BMNH now possesses a male and female specimens. The male specimen bears the labels: 'Type (red) / Port Moresby, N. New Guinea, Goldie / Godman & Salvin Coll. 96–12.' In addition the male bears the following labels; 'Lectotype (purple) / *Terias papuana* Butler LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels, and in addition the following labels; 'Paralectotype (blue) / *Terias papuana* Fruhstorfer PARALECTOTYPE det. O. Yata 1990'.

Material studied: NEW GUINEA: S. E. Papua New Guinea, Wau, 2 ♂, 25–30. xii. 1970, 1 ♀, 6. i. 1974 (SHINONAGA); Wau, Mt. Kaindi, 1 ♂ 1 ♀, 18. xii. 1973 (SUEFUJI) [KUCGE].

Distribution: This subspecies occurs in S. Papua New Guinea, Misol Is.? and Queensland.

Eurema puella virgo (WALLACE, 1867)

Terias virgo WALLACE, 1867: 328. (Aru) [untraced]

Terias candida virgo (WALLACE); FRUHSTORFER, 1910: 172.

Eurema candida virgo (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 189.

The subspecies is distinguishable from the nominate subsp. *candida* from Ambon by the following combination of characters.

Male (Pl. 11 (1–2)). *Upperside*: Forewing black distal border narrower, gradually narrowed posteriorly; hindwing black distal border narrower; basal portions of both wings more narrowly and weakly blackish. *Underside*: Black distal borders narrower, gradually narrowed posteriorly. **Female** (Pl. 11 (3–4)). *Upperside*: Ground colour milky-white with pale greenish yellow tinge; forewing black distal

border narrower, gradually narrowed posteriorly; hindwing black distal border narrower, tapering posteriorly; basal portions of both wings almost not black dusted. *Underside*: Ground colour somewhat darker; forewing costa not whitish; black distal borders narrower, gradually narrowed posteriorly.

Forewing length: Male 23.0 mm, female 24.0 mm.

Material studied: ARU ISLS: Aru Is., 1 ♂ 1 ♀, 9. vi. 1879? (HEWITSON) (*Terias candida* 8) [BMNH]; Dobo, 1 ♂, 11. iii. 1915 (C. (1911–319)(B. KLOSS) [BMNH]; 1 ♂ 1 ♀, x. 1979 [ET?].

Distribution: This subspecies occurs only in Aru Isls.

The *tilaha* subgroup

Eurema lombokiana (FRUHSTORFER, 1897)

[Pls. 16–17]

Terias lombokiana FRUHSTORFER, 1897: 8. LECTOTYPE ♂ (Lombok) here designated. [BMNH, examined]

Eurema lombokiana (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 187.

Diagnosis: Forewing black distal border with its inner edge almost right-angled at vein 4; hindwing black distal border increasing in width towards tornus; underside markings very small and faint; discocellular marking represented by a faint black bar; hindwing with a series of submarginal spots arranged in an evenly curved line; vein-dots conjoined with narrow and black anteciliary line; uncus short, with uncal projection strongly developed with its apex weakly bicuspid; P3 slender with blunt apex; P5 of valva much flattened and beak-shaped; lateral hollow elliptical, median groove with a narrow internal slucus; banks of longitudinal groove strongly compressed on its anterior half.

Description: **Male** (Pls. 16 (1–4, 7–8), 17 (1–2, 5–8)). *Upperside*: Ground colour yellow. Forewing black costal border broad, gradually broadened distally with its inner margin sharply defined; black distal border broad, with its inner edge oblique and irregular from costa to vein 4, almost right-angled at vein 4, more deeply excavated in space 2 than in space 3, diffusely zigzag-shaped in spaces 1a and 1b+c, sometimes extending very narrowly and diffusely towards base along basal margin in space 1a; discocellular spot absent; fringe black. Hindwing black distal border usually narrow, increasing in width towards tornus, but usually tapering near apex and tornus, narrowly interrupted at the middle of each space, with its inner edge somewhat diffused, sometimes weakly zigzag-shaped; anal border sometimes represented by scattered black scales continued along vein 1a to base; fringe black. Basal portions of both wings narrowly blackish. *Underside*: Ground colour somewhat paler than on upperside. Forewing without apical or subapical patch; a small and faint spot in discoidal cell; discocellular marking represented by a faint black bar which is

usually divided into an upper and a lower black spots, covering more than half of the discocellular vein; tornal spot absent; sex-brand reddish brown, short and narrow, ending slightly before a point of origin of vein 2; small vein-dots much reduced, almost conjointed with anteciliary line; fringe black. Hindwing with a series of submarginal spots in spaces $1b+c$ to 8 arranged in an evenly curved line parallel to wing margin, and submarginal spots each in spaces 7 and 8 close to each other across vein 8, but never conjointed with each other; circular subbasal dots present each in spaces $1b+c$ and 7; a minute basal spot absent; discocellular spot almost same as in forewing, but somewhat longer; vein-dots same as in forewing; fringe black. Ultra-violet reflectance on upperside: Structurally reflective on yellow areas except tornal to anal area of hindwing, appearing bright-white in UV-photos (Pl. 21 (8, upper) in Part II).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing slightly or fairly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black, white-checked on ventral surface, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal line appearing along the lateral margin of abdominal terga.

Forewing length: 19.2–22.5 mm.

Female (Pl. 16 (5–6), 17 (3–4)). Similar to male, but differing as follows. Ground colour paler. *Upperside*: Forewing black costal border sometimes more strongly diffused; black distal border slightly broader, with its inner edge more deeply excavated in spaces 2 and 3, slightly inclined towards tornus, not extending towards base; hindwing black distal border gradually broadened towards tornus, with its inner edge more strongly diffused. *Underside*: Most markings generally more distinct. Ultraviolet reflectance on upperside: Almost absorbed, appearing dark grey in UV-photos (Pl. 21 (8, lower) in Part II).

Forewing length: 20.5–22.0 mm ($n=6$, $avg=21.5$ mm).

Male genitalia (Fig. 10): Tegumen narrow, triangular in dorsal aspect, somewhat concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus long (0.87 of ring height), angle between vinculum and saccus $80-90^\circ$. Uncus short (dorsum proper 0.58–0.7 of ring height), extending strongly downwards; uncal projection well projecting posterodorsally (0.17–0.23 of ring height), with its apex weakly bicuspid. Valva almost as long as high; P1 somewhat weakly sclerotized, much shorter than P4, extending anteriorly; P2 broadly produced; P3 slender, with its apex more or less pointed; P4 represented by two processes which are almost same in length and shape, and their apices curved ventrally; P5 much flattened and beak-shaped. Phallus very long, somewhat thickened, and strongly arched dorsally, subzonal sheath about as long as $1/4$ length of phallus or shorter. Juxta weakly sclerotized, consisting of a

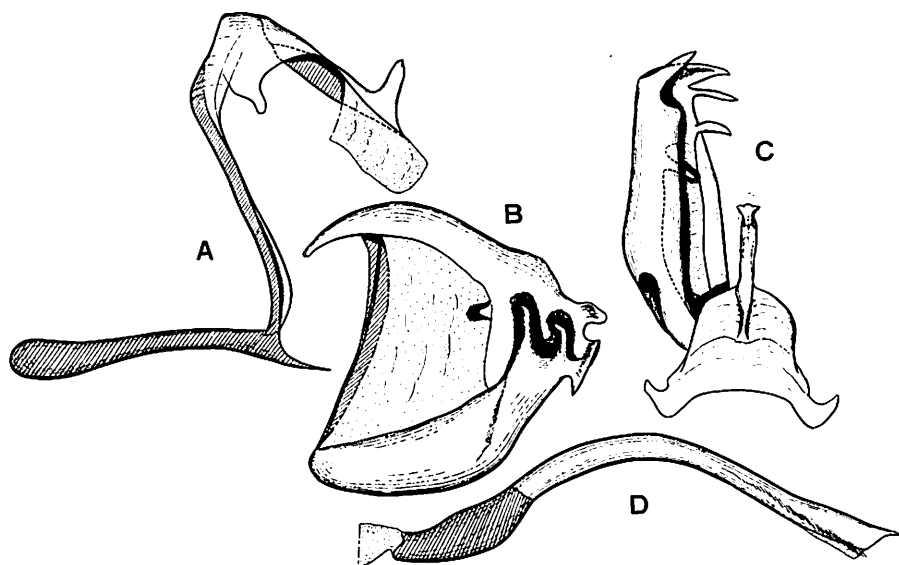


Fig. 10. Male genitalia of *Eureka lombokiana* (FRUHSTORFER, 1897) from Lombok. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 11): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, with dorsal eaves barely traceable, ventral eaves long and deep, median groove very long with long and narrow internal sulcus, having a long median eaves situated ventral $1/2$ of lateral hollow. Genital plate weakly invaginated ventromedially; longitudinal groove weakly sclerotized, narrow and deep, broadened posteriorly; banks of longitudinal groove developed, strongly compressed in its anterior half, where numerous stipples are regularly arranged. V-shaped wall undeveloped, but broad swelling produced either side of ostium bursae. Ostium bursae opening near the middle of genital plate. Ductus bursae about 1–1.67 length of cervix bursae, membranous but weakly sclerotized on anterior $1/3$. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly longer than apophysis posterioris, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: Although this species does not show considerable variation within Lombok, Sumba and Timor, it does rather remarkable variation in Flores, especially in the black distal borders on upperside. The seasonal polyphenism is unknown.

Type material examined: *Terias lombokiana* was described from an unstated number of male specimens from 'Lombok' by FRUHSTORFER. The BMNH now possesses a

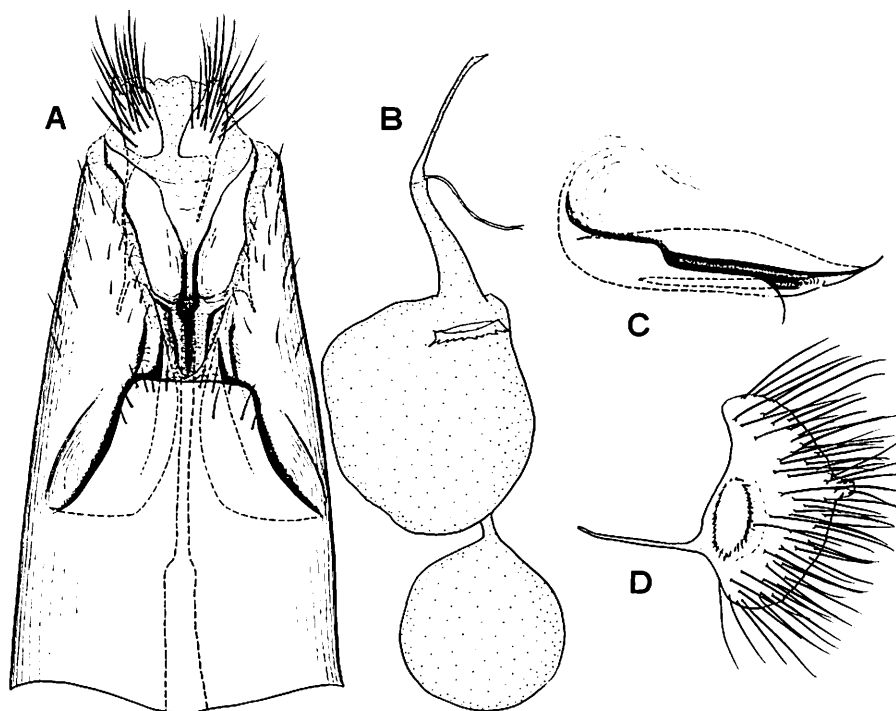


Fig. 11. Female genitalia of *Eurema lombokiana* (FRUHSTORFER, 1897) from Lombok. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Lateral hollow (lateral). D: Papilla analis (lateral).

male specimen which bears the labels: 'Type (red) / Lombok, Sapit 2000', Mai-Juni 1896, H. Fruhstorfer / *lombokiana*, Fruhst. / T.G.H., 1966–688 / Fruhstorfer Coll / B.M. 1937–285'. In addition the male bears the following labels; 'Lectotype (purple) / *Terias lombokiana* Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype.

Material studied: LOMBOK: Mt. Pusuk (300 m), 23. xii. 1973 (SHINONAGA); Anpenan, 1 ♀, 23. vii. 1978 (S. YUKIZAWA) SUMBA: 2 ♀, 5–16. ii. 1980 [ET]; E. Sumba Is., Kambata, Wandut, 5 ♂2 ♀, 10. ix. 1979 (KASHIWAI) [KUCGE]. W. FLORES: Ruteng, 1 ♂1 ♀, 21–31. xii. 1979 [ET]. TIMOR: 1 ♂, 12. viii. 1967 [NSA].

Relationship: This species is very similar in appearance to the species of the *lacteola* subgroup, but in fact it belongs to the *tilaha* subgroup. This butterfly is undoubtedly most closely allied to *E. timorensis* and these two are inferred to form a monophyletic group, with which the *tilaha* complex is united.

Distribution: This species occurs in the Lesser Sundas (Lombok, Sumba, Flores, Adonara and Timor).

Habitat and habits: This rather rare and local butterfly mainly inhabits mountainous forests (about 300–1000 m alt.).

Early stages: The early stages are unknown.

***Eurema timorensis* SHIRÔZU & YATA, 1977**

[Pl. 18]

Eurema timorensis SHIRÔZU & YATA, 1977: 340, figs 1–4. (Timor) [NSA, examined]

Diagnosis: Forewing length less than 23 mm. Black distal border on forewing upperside with its inner edge bluntly obtuse-angled at vein 4, spot absent; discocellular marking represented by a faint black bar; hindwing with a series of submarginal spots arranged in an evenly curved line; vein-dots conjointed with narrow and black anticiliary line; uncus short, with uncal projection well developed with its apex strongly bicuspid; P3 slender with blunt apex; P5 of valva much flattened and beak-shaped; lateral hollow elliptical, median groove without any sulcus internally; banks of longitudinal groove strongly compressed on its anterior half.

Description: Male (Pl. 18 (1–4, 7–8)). *Upperside:* Ground colour yellow. Forewing black costal border broad, gradually broadened distally, with its inner edge sharply defined; black distal border broad, with its inner edge oblique from costa to vein 4, bluntly obtuse-angled at vein 4, more deeply excavated in space 2 than in space 3, diffusely zigzag-shaped in spaces 1a and 1b+c; discocellular spot absent; fringe black. Hindwing black distal border somewhat broad, becoming increasing in width towards tornus, but tapering near apex and tornus, narrowly and weakly interrupted at the middle of each space, with its inner edge somewhat diffused; anal border undeveloped; fringe black. Basal portions of both wings almost not blackish. *Underside:* Ground colour somewhat paler than on upperside. Forewing without apical or subapical patch; discoidal cell spot absent; discocellular marking represented by a faint black bar which is divided into an upper and a lower black spots, covering more than half of the discocellular vein; tornal spot absent; sex-brand pale reddish brown, long and narrow, ending somewhat before a point of origin of vein 2; small vein-dots much reduced, almost conjointed with anticiliary line; fringe black. Hindwing with a series of submarginal spots in spaces 1a to 8 arranged in an evenly curved line parallel to wing margin, but those in spaces 1a to 8 barely traceable; submarginal spots in spaces 7 and 8 close to each other across vein 8, but never conjointed with each other; subbasal dots present each in spaces 1b+c and 7; a minute basal spot absent; discocellular spot almost same as in forewing, but somewhat longer; vein-dots same as in forewing; fringe black. Ultraviolet reflectance on upperside: Structurally reflective on yellow areas except tornal to anal area of hindwing, appearing bright-white in UV-photos (Pl. 21 (9, upper) in Part II).

Forewing somewhat rounded at apex; distal margin fairly convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black, white-checked except on posterodorsal surface and a few apical segments, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal line appearing along the lateral margin of abdominal terga.

Forewing length: 15.5–17.3 mm ($n=3$, avg=16.1 mm).

Female. Similar to male, but differing as follows. Ground colour paler. *Upperside*: Forewing black costal border more strongly diffused; black distal border slightly broader, with its inner edge more deeply excavated in spaces 2 and 3, inclined towards tornus; hindwing black distal border broader towards tornus, with its inner edge more strongly diffused. *Underside*: Most markings generally more distinct. Ultraviolet reflectance on upperside: Moderately reflective on basal half of forewing, appearing whitish in UV-photos (Pl. 21(9, lower) in Part II).

Forewing length: 15.5–18.0 mm ($n=2$, avg=16.8 mm).

Male genitalia (Fig. 12): Tegumen narrow, triangular in dorsal aspect, somewhat concaved dorsomedially, entirely sclerotized; Valvenansatz short, strongly curved anteriorly on apical half; vinculum not strongly arched; saccus fairly long,

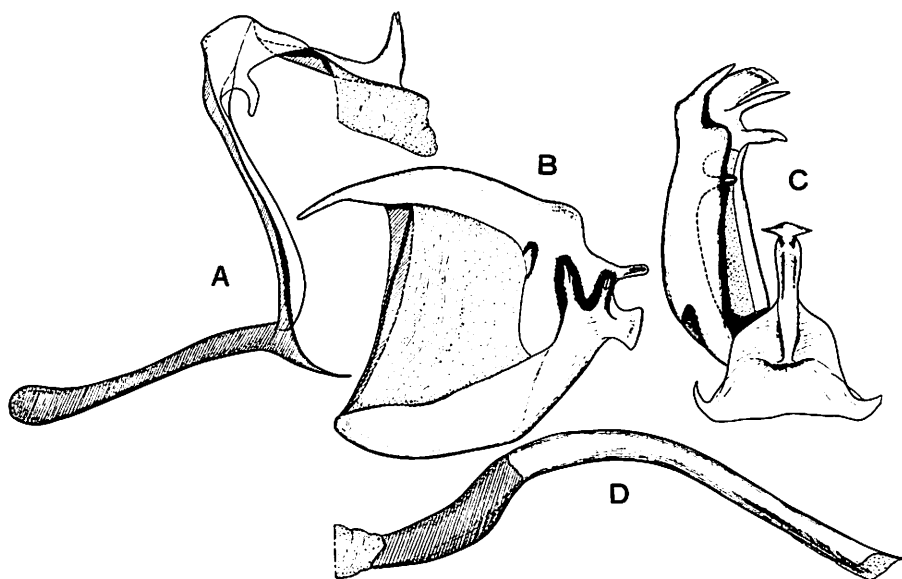


Fig. 12. Male genitalia of *Eurema timorensis* SHIRÔZU & YATA, 1977 from Timor. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

angle between vinculum and saccus $80-90^\circ$. Uncus short, extending strongly downwards; uncal projection long projecting posterodorsally, with its apex strongly bicuspid. Valva as long as high; P1 somewhat weakly sclerotized, much shorter than P4, extending almost laterally or somewhat posteriorly; P2 broadly produced and appearing as a large protuberance; P3 slender, parallel-sided, its apex bluntly ended; P4 represented by two processes which are almost same in length and shape, and their apices curved ventrally; P5 much flattened. Phallus long, somewhat thickened, strongly arched dorsally, subzonal sheath about as long as $1/4$ length of phallus or shorter. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 13): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, with dorsal eaves barely traceable, ventral eaves long and deep, median groove long, having a long eaves and situated ventral $1/2$ of lateral hollow. Genital plate weakly invaginated ventromedially;

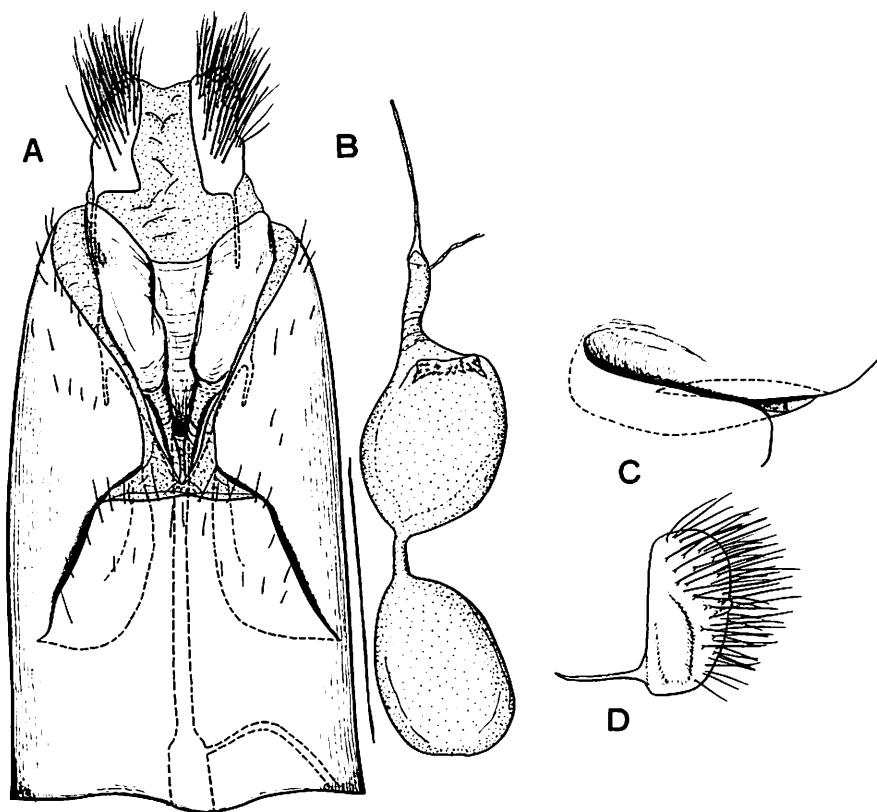


Fig. 13. Female genitalia of *Eurema timorensis* SHIRÔZU & YATA, 1977 from Timor. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Lateral hollow (lateral). D: Papilla analis (lateral).

longitudinal groove weakly sclerotized, broad and deep, gradually broadened posteriorly; banks of longitudinal groove well developed, strongly compressed on its anterior half, where numerous stipples are regularly arranged. V-shaped wall undeveloped, but broad and weak swelling produced either side of ostium bursae. Ostium bursae opening on anterior portion of genital plate. Ductus bursae about 1.5 length of cervix bursae, membranous but weakly sclerotized on anterior 1/4. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly hamulate upwards at the tip and longer than apophysis posterioris, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: As far as I know (3 ♂, 3 ♀), this species does not show considerable variation. The seasonal polyphenism is unknown.

Type material examined: *Eurema timorensis* was described from male and female specimens by SHIRÔZU & YATA. The holotype male specimen is now in NSM and bears the following labels; '[TIMOR] Pariti, 19. xii. 1973, (S. Shinonaga) [NSM] / *Eurema timorensis* Shirôzu & Yata, 1977 Holotype ♂ (red)'. The NSM and KUCGE possesses 2 males and 2 females, bearing similar data labels '(Paratype (orange))'.

Material studied: FLORES: Borong, 7. vi. 1981 [ET?]. ADONARA: 1 ♂ 1 ♀ Xi. 1891 (W. DOHERTY) [BMNH].

Taxonomic remarks: This species was found in the materials collected in 1973–74 by the members of the research project of "Zoogeographical studies on the dipterous insects of medical importance in the South Pacific area" (the leader: Prof. Rokuro KANO of Tokyo Medical & Dental University). This is most similar to *E. lombokiana* and these two are almost replacing each other, but considering the differences of general appearance and male genitalia among their allied species, the former should be treated as a distinct species rather than a subspecies within the latter. In this connection, a single female of this species was recently collected on Flores where is in the range of *lombokiana*.

Relationship: This species is most closely related to *E. lombokiana* and the two species are inferred to form a monophyletic group, with which *tilaha* complex is united.

Distribution: This species occurs in Timor, Adonara and Flores.

Habitat and habits: The habitat and habits are unknown, though the data labels indicate its preference to lowland (about 10 m alt.).

Early stages: The early stages are unknown.

Eurema tominia (VAN VOLLENHOVEN, 1865)

[Pls. 19–23]

Terias tominia VAN VOLLENHOVEN, 1865: 66, t. 7, fig. 4. (N. Celebes)*Terias tondana* C. & R. FELDER, 1865: 214, t. 26, figs. 1, 2. (Tondano)*Terias talissa* WESTWOOD, 1888: 469, pl. 12, fig. 1. (Talissee Is.)

Diagnosis: Basal part of basal border on forewing upperside entirely black including veins; hindwing black distal border continued to wing base; discoidal cell spot and hindwing subbasal spots usually absent; discocellular spot represented by black bar; vein-dots conjointed with black anticiliary line; P3 of valva slender with its apex sharply pointed and sinuate upward; P5 of valva much flattened and beak-shaped; lateral hollow almost rounded, median groove with broad and deep concavity; banks of longitudinal groove strongly compressed anterior half; weakly developed swelling produced either side of ostium bursae.

Description: Male. Upperside: Ground colour yellow. Forewing black costal border fairly broad, with its inner margin sharply defined; black distal border broad, with its inner edge oblique and irregular from costa to vein 4, much obtuse-angled at vein 4, more deeply excavated in space 2 than in space 3; black basal border always well developed, usually occupying space 1a and 1b+c, with its inner margin almost uniform, having black veins in basal portion; discocellular spot absent; fringe black. Hindwing black distal border very broad, becoming broadened towards tornus, continuing to base along anal margin, with its inner edge almost uniform. **Underside:** Ground colour somewhat paler than on upperside. Forewing without markings except for discocellular and tornal spots; discocellular marking represented by black bar which is divided into an upper and a lower spots; covering more than half of the discocellular vein; tornal spot represented by an oblique and faint streak; sex-brand reddish brown, long and narrow, usually ending a point of origin of vein 2; vein-dots conjointed with distinct black anticiliary line; fringe black, mixed with yellow. Hindwing with a series of submarginal spots in spaces 1b+c to 8 arranged in an evenly curved line parallel to wing margin, but usually disappearing in spaces 1b+c to 4; submarginal spot in spaces 7 and 8 roundish, situated in midway between submarginal spots and discocellular spot; circular subbasal spots absent; a minute basal spot absent; discocellular spot almost same as in forewing, but sometimes disappearing posterior half; vein-dots almost same as in forewing; fringe black, mixed with yellow. Ultraviolet reflectance on upperside: Structurally reflective on yellow area, but diffused distally in forewing, appearing bright-white in UV-photos (Pl. 30 (1, upper)).

Forewing somewhat rounded at apex; distal margin fairly convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ – $1/6$ length of *ldc*. Antenna somewhat less than half the length of forewing, black, white-checked on ventral

surface, club cylindrical. Thorax and abdomen black, beneath whitish-yellow, clothed with black hairs on thorax and base of abdomen.

Forewing length: 17.5–26.0 mm.

Female. Similar to male, but differing as follows. Ground colour paler and sometimes more heavily black dusted. *Upperside*: Forewing black distal border usually very much broader, with its inner edge more indistinct; black basal border usually much broader, occupying almost the whole of spaces 1a to 2, more broadly developed in discoidal cell and sometime extended the whole of discoidal cell; hindwing black distal and anal borders much broader, especially towards tornus, with its inner edge more strongly diffused. *Underside*: Most markings generally more well developed; submarginal faint streak in forewing usually appearing; tornal spot very well developed, streamline-shaped, occupying almost the whole of spaces 1a and 1b+c. Hindwing submarginal spots usually appearing in spaces 3 to 8. Ultra-violet reflectance on upperside: Almost absorbed, appearing entirely black in UV-photos, but sometimes weakly reflective in yellow area (Pl. 30 (1, lower)).

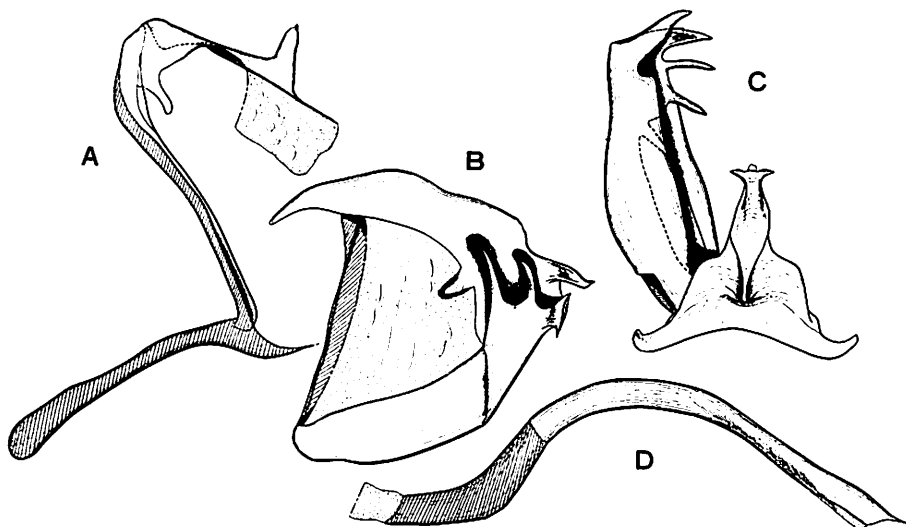


Fig. 14. Male genitalia of *Eurema tominia tominia* (VAN VOLLENHOVEN, 1865) from Sulawesi.

A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

Forewing length: 18.0–28.5 mm.

Male genitalia (Fig. 14): Tegumen narrow, triangular in dorsal aspect, somewhat concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus long (0.78–0.85 of ring height), angle between vinculum and saccus 80–90°. Uncus short (dorsum proper 0.55 of ring height), extending strongly downwards; uncal projection well projecting

posterodorsally (0.21 of ring height), with its apex strongly bicuspid. Valva almost as long as high; P1 somewhat weakly sclerotized, shorter than P4, extending anteriorly; P2 absent; P3 slender, with its apex sharply pointed and sinuate upward; with its apex bluntly pointed; P4 represented by two processes which are almost same in length and shape, and their apices curved ventrally; P5 of valva much flattened and beak-shaped. Phallus long, slender and strongly arched dorsally, subzonal sheath about as long as $1/3.5$ length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

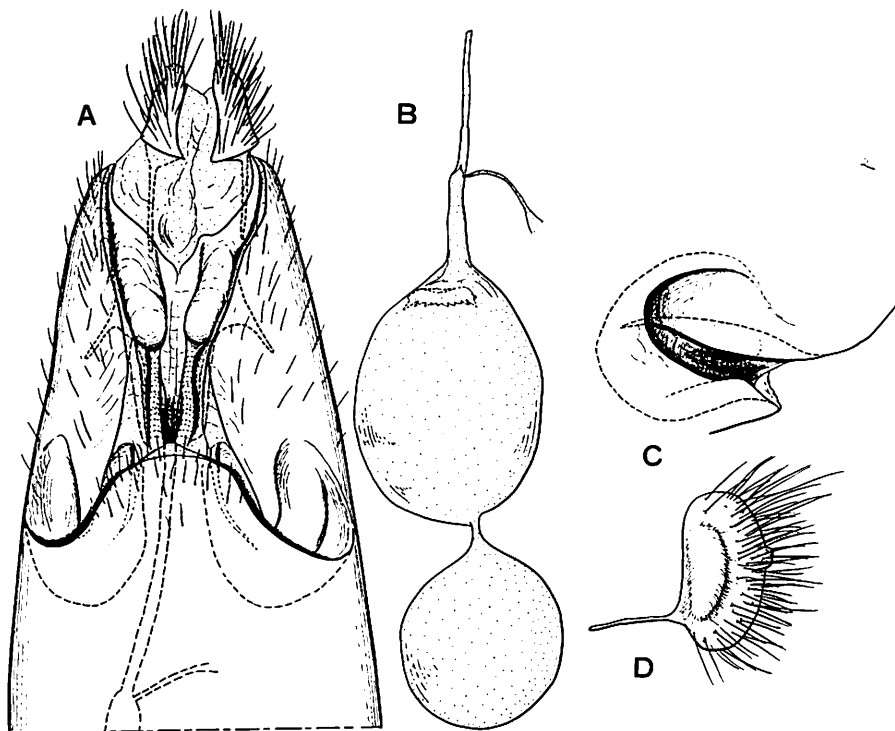


Fig. 15. Female genitalia of *Eurema tominia tominia* (VAN VOLLENHOVEN, 1865) from Sulawesi.
A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Lateral hollow (lateral). D: Papilla analis (lateral).

Female genitalia (Fig. 15): Seventh abdominal sternum with slightly convex posterior margin. Lateral hollow almost rounded, with dorsal eaves developed and conjointed with ventral eaves which are long and very deep, median groove with broad and deep concavity, having a long median eaves situated ventral $1/2$ of lateral hollow. Genital plate weakly invaginated ventromedially; longitudinal groove weakly sclerotized, broad and deep, broadened posteriorly, with indistinct longitudinal sulcus; banks of longitudinal groove developed, strongly compressed in its anterior

half with numerous stipples regularly arranged. V-shaped wall undeveloped, but weak swelling produced either side of ostium bursae. Ostium bursae opening in the anterior portion of genital plate. Ductus bursae about 1.25 length of cervix bursae, membranous but weakly sclerotized on anterior 1/4. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly longer than apophysis posterioris, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: This species shows distinct geographical variation in its wing markings and size. In Celebesian races, the extreme development of black basal and anal borders on upperside is also seen as in *E. alitha* and *E. blanda*. The seasonal polyphenism is unknown.

Taxonomic remarks: This species is exceptionally well classified taxa within the Old World polytypic *Eurema* species, because its classification and nomenclature has never been confused since FRUHSTORFER's revision appeared (FRUHSTORFER, 1910).

Relationship: This species seems to be most closely related to *tilaha-nicevillei* and these two are inferred to form a monophyletic group (the *tilaha* section).

Distribution: This species occurs in Borneo, Belitung Is., Sulawesi and its neighboring islands.

Habitat and habits: This butterfly seems to inhabit lowland or hill forest. According to HOLLOWAY (1973), *E. tominia nabalua* from Mt. Kinabalu, N. Borneo was usually found in wet forest at moderate elevations, being rarely seen in plain. However, this and *E. nicevillei nicevillei* flew together in wet lowland forest near the hills (HOLLOWAY, 1973).

Early stages: The early stages are poorly known. According to FRUHSTORFER (1911) [cited from KÜHN, 1887], the larva is bluish green with short black setae, and the pupa is of *hecabe* type, being flat with bulged wing sheaths and acute cephalic projection, but the dorsal ridge is bordered with brown. The foodplant is a tall tree belonging to Fabaceae.

Eurema tominia tominia (VAN VOLLENHOVEN, 1865)

Terias tominia VAN VOLLENHOVEN, 1865: 66, t. 7, fig. 4. (Tomini, N. Celebes) [untraced]

Terias tondana f. *battana* FRUHSTORFER, 1908: 63. LECTOTYPE ♂ (Bouthain, S. Celebes) here designated. [BMNH, examined]

Terias tominia tominia (VAN VOLLENHOVEN); FRUHSTORFER, 1910: 170. (Bouthain)

Terias tominia toradja FRUHSTORFER, 1910: 171. (E. Celebes) [BMNH, Syntypes ♂♀, examined]

Eurema tominia tominia (VAN VOLLENHOVEN); CORBET & PENDLEBURY, 1932: 187.

The nominate subspecies is characterized by the following combination of character.

Male (Pl. 19 (1-2)). **Upperside:** Forewing black basal border occupying spaces

1a and 1b+c, and posterobasal 1/3 of discoidal cell with its inner margin uniform. Hindwing black distal border almost occupying spaces 1a to 3. *Underside*: Hindwing with a series of submarginal spots in spaces 1b+c to 8, but often disappearing in spaces 1b+c to 4; discocellular spot divided into an upper and a lower spot, the latter of which sometimes disappearing; vein-dots usually conjoined with distinct black anteciliary line. **Female** (Pl. 19 (3-4)). *Upperside*: Ground colour heavily black dusted; forewing black distal border very broad, with its inner edge very diffused; black basal border very broad, occupying almost the whole of discoidal cell, as a result an oblique and black dusted yellow band recognizable from costa to tornus, and this band rarely almost disappearing; hindwing black anal border much broader, occupying almost the whole of discoidal cell, as a result an elongate and black dusted yellow costal patch recognizable. *Underside*: Ternal spot sharply defined, occupying the whole of spaces 1a and 1b+c. Hindwing submarginal spots appearing in spaces 3 to 8, but usually barely traceable in spaces 3 and 4.

Forewing length: Male 24.0–26.0 mm (n=7, avg=25.2 mm), female 23.0–28.5 mm (n=3, avg=25.7 mm)

Type material examined: *Terias tominia battana* was described from an unstated number of male and female specimens from 'S. Celebes' by FRUHSTORFER. The BMNH now possesses a male and female specimens. The male specimen bears the labels: 'Type (red) / S. Celebes, Lompa-Battau, 3000' März 1896, H. Fruhstorfer / tominia battana Fruhst.' In addition the male bears the following labels; 'Lectotype (purple) / *Terias tominia battana* Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels, and in addition the following labels; 'Paralectotype (blue) / *Terias tominia battana* Fruhstorfer PARALECTOTYPE det. O. Yata 1990'.

Material studied: SULAWESI: N. & W. Sulawesi, Menado, 2 ♀, 17. ii. 1968 (IGARASHI) [IGARASHI Coll.]; Noongan, 50 km south of Menado (1200 m), 1 ♂ 1 ♀, 9. xii. 1973 (H. SHIMA) [KUCGE]; S. Sulawesi, Makassar (50 m), 2 ♂, 28–30. xi. 1973 (H. SHIMA); Bantimurung, 4 ♂, 5–8. xii. 1972 (IGARASHI) [IGARASHI Coll.]; 'Celebes', 1 ♂, 1. i. 1974 (NAKAYAMA) [KUCGE].

Distribution: This subspecies occurs in Sulawesi.

Eurema tominia nabalua CORBET & PENDLEBURY, 1932

Eurema tominia nabalua CORBET & PENDLEBURY, 1932: 186. (Mt. Kinabalu) [untraced]
Terias tominia nabalua (CORBET & PENDLEBURY); TALBOT, 1935.

This subspecies is distinguishable from the nominate subsp. *tominia* from Sulawesi by the following combination of characters.

Male (Pl. 19 (5-6)). *Upperside*: Forewing black basal border slightly narrower, occupying spaces 1a and 1b+c, and posterobasal 1/4 of discoidal cell, sometimes

almost disappearing in space 1b+c, with its inner margin sometimes irregular. Hindwing black anal border narrower. *Underside*: Most markings smaller and fainter. Hindwing with a series of submarginal spots disappearing in spaces 1b+c to 5 and sometimes also in space 6; discocellular spot divided into an upper and a lower spot, the latter of which is often almost disappearing. **Female** (Pl. 19 (7-8)). *Upperside*: Ground colour not black dusted; forewing black distal border much narrower, with its inner edge more distinct; black basal border narrower, occupying 2/3-1/3 of discoidal cell. Hindwing black anal border narrower, not extending into the discoidal cell. *Underside*: Most markings fainter; tornal spot smaller and fainter, almost disappearing in space 1b+c. Hindwing submarginal spots disappearing in spaces 3 and 4.

Forewing length: Male 22.5-25.5 mm (n=5, avg=24.3 mm), female 24.5-25.5 mm (n=3, avg=24.8 mm)

Material studied: N. BORNEO: N. Borneo, 1 ♂, 18. viii. 1968 (G. IMADATE) [NSA]; Sarawak, Kuala Bok, 1 ♀, 27. ii. 1969, 2 ♂, 8. iii. 1969 (KUNOU & ARITA), 1 ♂, 16. xii. 1968 (M. SATO) [MUFA]; Sabah, Kundasang, 1 ♂, 27. vii. 1970 (Y. YAMADA) [TUA]; Mt. Kinabaru, 1 ♀, 24. iii. 1974 (IWANAGA); Hot Spring, 1 ♀, 15. viii. 1968 (K. F.) [OMNH].

Distribution: This subspecies occurs in N. Borneo.

***Eurema tominia horatia* (FRUHSTORFER, 1910)**

Terias tominia horatia FRUHSTORFER, 1910: 171, t. 73g. LECTOTYPE ♂ (Pontianak, S. Borneo) here designated. [BMNH, examined]

Eurema tominia horatia (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 186.

This subspecies is distinguishable from the nominate subsp. *tominia* from Sulawesi by the following combination of characters.

Male (Pl. 20 (1-4)). *Upperside*: Forewing black basal border slightly narrower, occupying spaces 1a and 1b+c, and posterobasal 1/5 of discoidal cell. Hindwing black anal border narrower. *Underside*: Most markings smaller and fainter. Hindwing with a series of submarginal spots disappearing in spaces 1b+c to 4 and sometimes also in space 5; discocellular spot divided into an upper and a lower spot, the latter of which is barely traceable. **Female** (Pl. 20 (5-6)). *Upperside*: Ground colour not black dusted; forewing black distal border narrower, with its inner edge more sharply defined, more acutely angled at vein 4; black basal border narrower, occupying 2/3 of discoidal cell, with its inner edge more distinct. Hindwing black anal border somewhat narrower, with its inner edge more distinct. *Underside*: Most markings fainter; tornal spot smaller and fainter, almost disappearing basal 2/3.

Forewing length: Male 24.5-25.5 mm (n=2, avg=25.0 mm), female 26.5 mm.

Type material examined: *Terias tominia horatia* was described from an unstated number of male and female specimens from 'S. Borneo' by FRUHSTORFER. The

BMNH now possesses a male and female specimens. The male specimen bears the labels: 'Type (red) / S. Borneo, H. Fruhstorfer / horatia, Fruhst.' In addition the male bears the following labels; 'Lectotype (purple) / *Terias tominia horatia* Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels (Fruhstorfer Coll., B.M.1937-285.), and in addition the following labels; 'Paralectotype (blue) / *Terias tominia horatia* Fruhstorfer PARALECTOTYPE det. O. Yata 1990'.

Material studied: S. BORNEO: Kalimantan, 1 ♂, 10. iii. 1981, 1 ♀, 21. iii. 1981, 1 ♂, 28. iii. 1981 (NAKAYAMA) [KUCGE].

Distribution: This subspecies occurs in S. Borneo.

Eurema tominia mangolina (FRUHSTORFER, 1910)

Terias tominia mangolina FRUHSTORFER, 1910: 171, t. 73h. LECTOTYPE ♂ (*Sula Mangoli*) here designated. [BMNH, examined]

Terias tominia besina FRUHSTORFER, 1910: 171. (*Sula Besi*) [BMNH, Syntypes ♂ ♀, examined]

Eurema tominia mangolina (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 186.

This subspecies is distinguishable from the nominate subsp. *tominia* from Sulawesi by the following combination of characters.

Male (Pl. 20 (7-8)). *Upperside:* Forewing sometimes with discocellular black bar. *Underside:* Hindwing with a series of submarginal spots disappearing in spaces 1b+c to 4; discocellular spot disappearing in its posterior half. **Female** (Pl. 21 (1-4)). *Upperside:* Ground colour more heavily black dusted; forewing black borders much broader, with its inner edge more strongly diffused; black basal border, as a result an oblique and black dusted yellow band barely traceable. Hindwing borders much broader, with its inner edge more strongly diffused, as a result an elongate and black dusted yellow costal patch barely traceable. *Underside:* Most markings slightly more distinct.

Forewing length: Male 25.5 mm, female 24.0-25.5 mm (n=2, avg=24.8 mm).

Type material examined: *Terias tominia mangolina* was described from an unstated number of male and female specimens from 'Sula Mangoli' by FRUHSTORFER. The BMNH now possesses a male and female specimens. The male specimen bears the labels: 'Type (red) / Sula Mangoli, Oct.-Novbr. Doherty, ex coll. H. Fruhstorfer / *tominia mongolina* Fruhst. / Fruhstorfer Coll, B.M. 1937-285.' In addition the male bears the following labels; 'Lectotype (purple) / *Terias tominia mongolina* Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels, and in addition the following labels; 'Paralectotype (blue) / *Terias tominia mongolina* Fruhstorfer PARALECTOTYPE det. O. Yata 1990'.

Material studied: SULA ISLS.: Sanana, 1 ♂, 1. xii. 1979 [ET]. BANGGAI (PELENG) IS.: Peleng, 1 ♀, 26. x. 1983 (DETANI) [H. HAYASHI Coll.]; Lambioel?,

1 ♂, 3. i. 1936; Noelion Peling?, 1 ♀, 26. vii. 1938 [RNH].

Distribution: This subspecies occurs in Sula Isls. (Taliabu?, Mangole, Sanana) and Banggai (Peleng) Is.

***Eurema tominia talissa* (WESTWOOD, 1888)**

Terias talissa WESTWOOD, 1888: 469, pl. 12, fig. 1. (Talissee Is.) [untraced]

Terias tominia talissa WESTWOOD; FRUHSTORFER, 1910: 171.

Eurema tominia talissa (WESTWOOD); CORBET & PENDLEBURY, 1932: 186.

This subspecies is distinguishable from the nominate subsp. *tominia* from Sulawesi by the following combination of characters.

Male. *Upperside:* Forewing black distal border somewhat narrower, with its inner edge almost uniform; black basal border narrower, broadly concaved medially. Hindwing black border slightly narrower. Underside not examined. Forewing termen somewhat rounder. **Female.** *Upperside:* Ground colour less black dusted; forewing and hindwing black borders narrower. Underside not examined. [These descriptions are based on Figs. 17–18, Pl. 11 of YATA (1981)]

Forewing length: Male 26.0 mm, female 25.0 mm.

Material studied: Siau Is., 1 ♂, Tampungan, 12. viii. 1979, 1 ♀, Hulu, 13. viii. 1979.

Distribution: This subspecies occurs only in Talisse Isls.

***Eurema tominia arsia* (FRUHSTORFER, 1910)**

Terias tominia arsia FRUHSTORFER, 1910: 171. (Tanah Djampea) [untraced]

Eurema tominia arsia (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 187.

This subspecies is distinguishable from the nominate subsp. *tominia* from Sulawesi by the following combination of characters.

Male (Pl. 21 (5–8)). *Underside:* Markings smaller and fainter. Forewing apex with black marginal smudge; tornal spot always well developed. Hindwing with a series of submarginal spots disappearing in spaces 1b+c to 4; discocellular spot represented by black faint dot. **Female** (Pl. 22 (1–2)). *Upperside:* Ground colour not black dusted; forewing black distal border narrower, with its inner edge more sharply defined; black basal border much narrower, occupying 2/3 of discoidal cell, with its inner edge more distinct. Hindwing black anal border narrower, with its inner edge more distinct. *Underside:* Most markings fainter; forewing apex with marginal black smudge; hindwing submarginal spots disappearing in spaces 1a to 4, sometimes also in space 5; discocellular spot represented by black faint dot. Smaller in size.

Forewing length: Male 17.5–23.0 mm (n=8, avg=20.7 mm), female 18.0–22.0

mm ($n=3$, avg=20.5 mm).

Material studied: TANAHDJAMPEA: 1 ♀, 1888 [RNH]. KALAO IS.: 7 ♂ 3 ♀, vi. 1987 [KUCGE].

Distribution: This subspecies occurs in Tanahdjampea (Tanah Djampea) and Kalao Is.

***Eurema tominia halesa* (FRUHSTORFER, 1910)**

Terias tominia halesa FRUHSTORFER, 1910: 171. Holotype ♂ (Saleyer Is.). [BMNH, examined]

Eurema tominia halesa (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 187.

This subspecies is distinguishable from the nominate subsp. *tominia* from Sulawesi by the following combination of characters.

Male (Pl. 22 (3–4)). *Upperside:* Forewing black basal border slightly broader, especially towards base, occupying spaces 1a and 1b+c, and posterobasal 2/3–1/2 of discoidal cell. Hindwing black anal border slightly broader. *Underside:* Most markings smaller and fainter. Hindwing with a series of submarginal spots disappearing in spaces 1b+c to 4 and sometimes also in space 5; discocellular spot disappearing in its posterior half. **Female** (Pl. 22(5–6)). *Upperside:* Ground colour almost not black dusted; forewing black distal border slightly narrower, with its inner edge more sharply defined, more acutely angled at vein 4; black basal border narrower, with its inner edge more distinct. *Underside:* Most markings fainter; hindwing with a series of submarginal spots disappearing in spaces 1b+c to 3 and sometimes also in space 4.

Forewing length: Male 26.0 mm ($n=1$), female 25.5–26.0 mm ($n=2$, avg=25.8 mm).

Type material examined: *Terias tominia halesa* was described from a single male obtained by FRUHSTORFER. This holotype is now in the BMNH and bears the following labels; 'Type (red) / Saleyer, 19. III. 94, Fruhstorfer / tominia halesa Fruhst. / Fruhstorfer Coll., B.M. 1937-285'.

Material studied: Salajar, 2 ♀♀, 1888 [RNH].

Distribution: This subspecies occurs only in Salajar (Saleyer) Is.

***Eurema tominia faunia* (FRUHSTORFER, 1910)**

Terias tominia faunia FRUHSTORFER, 1910: 171. Holotype ♂ (Binungka, Tukang Besi Isls.). [BMNH, examined]

Eurema tominia faunia (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 187.

According to the original description and to the photograph of holotype (1 ♂) preserved in the British Museum (N. H.), this subspecies seems to be distinguished from the nominate subsp. *tominia* from Sulawesi by the following combination of

features.

Male (Pl. 22 (7–8)). *Upperside*: Forewing black distal border narrower, with its inner edge more shallowly excavated in spaces 2 and 3; black basal border much narrower, with its inner margin irregular. Hindwing black anal border much narrower. *Underside*: Most markings smaller and fainter. Smaller in size. **Female**. Not examined.

Type material examined: *Terias tominia faunia* was described from a male specimen by FRUHSTORFER. The holotype male specimen is now in the BMNH and bears the following labels; 'Type (red) / Birreerrgka Fruhstorfer / tominia faunia Fr. / faunia Fruhst. / Fruhstorfer Coll. B.M. 1937–285.'

Distribution: This subspecies occurs in Tukangbesi Archipelago.

***Eurema tominia theristra* (FRUHSTORFER, 1911)**

Terias tominia theristra FRUHSTORFER, 1911: 186. (Sangir Is.) [untraced]

Eurema tominia theristra (FRUHSTORFER); YATA, 1980: 250.

This subspecies is distinguishable from the nominate subsp. *tominia* from Sulawesi by the following combination of characters.

Male (Pl. 23 (1–2)). *Upperside*: Forewing black distal border broader, with its inner edge projected along each vein and connected with basal border in veins 3 and 4; black basal border broader, occupying posterobasal 1/2. Hindwing black distal border slightly broader, with its inner edge weakly produced in space 5. *Underside*: Hindwing with much more elongate tornal spot. **Female** (Pl. 23 (3–4)). *Upperside*: Ground colour more heavily black dusted; forewing black distal and basal borders extremely broader, as the result an elongate and yellow costal patch only recognizable. Hindwing with submarginal spots always appearing in spaces 3 to 8.

Forewing length: Male 24.0 mm, female 23.5–26.5 mm (n=2, avg=25.0 mm).

Material studied: Sangihe Is., 1 ♂, 30. vi. 1975, 1 ♀, 28. vi. 1975, 1 ♀, 1. vii. 1975, (IGARASHI) [IGARASHI Coll.]

Distribution: This subspecies occurs only in Sangihe (Sangir) Is.

***Eurema tilaha* (HORSFIELD, 1829)**

[Pls. 23–24]

Terias tilaha HORSFIELD, 1829: 136. (Java)

Terias eumide C. & R. FELDER, 1865: 214. ("Celebes"?)

Eurema tilaha (HORSFIELD); CORBET & PENDLEBURY, 1932: 183.

Diagnosis: Basal part of basal border of forewing upperside with yellow veins; forewing upperside with basal border right-angled in its inner edge near tornus; hindwing black distal border not continued to wing base; a spot in discoidal cell;

hindwing underside with a circular subbasal spot in discoidal cell; uncus short, with uncal projection well developed with its apex strongly bicuspid; P3 slender with blunt apex; P5 of valva much flattened and beak-shaped; lateral hollow elliptical, broadly expanded anteriorly, median groove with short and weak internal caves; banks of longitudinal groove strongly compressed anterior half; well developed swelling produced either side of ostium bursae.

Description: Male. *Upperside:* Ground colour greenish yellow. Forewing black costal border generally broad, with its inner margin sharply defined; black distal border broad, with its inner edge oblique and irregular from costa to vein 4, almost right- to acute-angled at vein 4, more deeply excavated in space 2 than in space 3, almost perpendicular to basal border in space 1b+c; black basal border always well developed, occupying space 1a, with its inner margin sometimes irregular, having yellow veins in basal portion; discocellular spot absent; fringe black. Hindwing black distal border broad, becoming slightly broadened towards tornus, with its inner edge distinctly zigzag-shaped; anal border sometimes represented by scattered black scales continued along vein 1a to base; fringe black. Basal portions of both wings narrowly blackish. *Underside:* Ground colour somewhat paler than on upperside. Markings generally more or less faint. Forewing with submarginal spots in spaces 3 to 9, often disappearing in space 3; a 3-shaped spot in discoidal cell; discocellular marking appearing by an irregular slender ring, covering more than half of the discocellular vein; tornal spot represented by an oblique streak; sex-brand reddish brown, long and narrow, ending a point of origin of vein 2; vein-dots well marked, sometimes faint black dots appearing at marginal middle point of each space in addition to vein-dots; fringe black, mixed with yellow. Hindwing with a series of submarginal spots in spaces 1a to 8 arranged in an evenly curved line subparallel to wing margin, and submarginal spot in spaces 7 and 8 comma-shaped and situated in midway between submarginal spots and discocellular spot; circular subbasal spots or roundish dots present each in spaces 1b+c and 7 and in the middle of discoidal cell; a minute basal spot absent; discocellular spot almost same as in forewing, but somewhat longer; vein-dots well marked; fringe yellow mixed with black. Ultra-violet reflectance on upperside: Almost absorbed, appearing entirely black in UV-photos (Pl. 30 (2, upper)).

Both wings somewhat elongate. Forewing somewhat angulate at apex; distal margin more or less convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black, white-checked on ventral surface, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal line barely traceable along the lateral margin of abdominal terga.

Forewing length: 17.5–24.0 mm.

Female. Similar to male, but differing as follows. Ground colour paler. *Upperside*: Forewing black distal border slightly broader, with its inner edge more deeply excavated in spaces 2 and 3; black basal border broader, especially towards base; hindwing black distal border broader, especially towards tornus, with its inner edge more strongly diffused; anal border more strongly developed. *Underside*: Tonal spot very well developed, streamline-shaped extending towards base in space 1b+c. Ultraviolet reflectance on upperside: Almost absorbed, appearing entirely black in UV-photos (Pl. 30 (2, lower)).

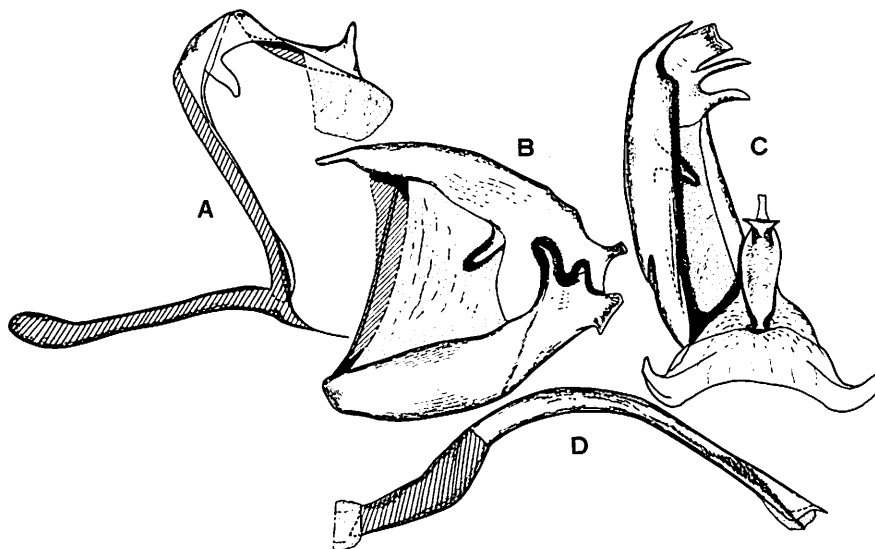


Fig. 16. Male genitalia of *Eurema tilaha tilaha* (HORSFIELD, 1829) from Java. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

Forewing length: 21.0–23.0 mm.

Male genitalia (Fig. 16). Tegumen narrow, triangular in dorsal aspect, somewhat concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus long (0.9 of ring height), angle between vinculum and saccus 80–90°. Uncus short (dorsum proper 0.62 of ring height), extending strongly downwards; uncal projection well projecting postero-dorsally (0.19 of ring height), with its apex strongly bicuspid. Valva almost as long as high; P1 somewhat weakly sclerotized, shorter than P4, extending anteriorly; P2 absent; P3 slender, with its apex bluntly pointed; P4 represented by two processes which are almost same in length and shape, and their apices curved ventrally; P5 much flattened and beak-shaped. Phallus long, slender and strongly arched dorsally, subzonal sheath about as long as 1/4 length of phallus or shorter. Juxta weakly

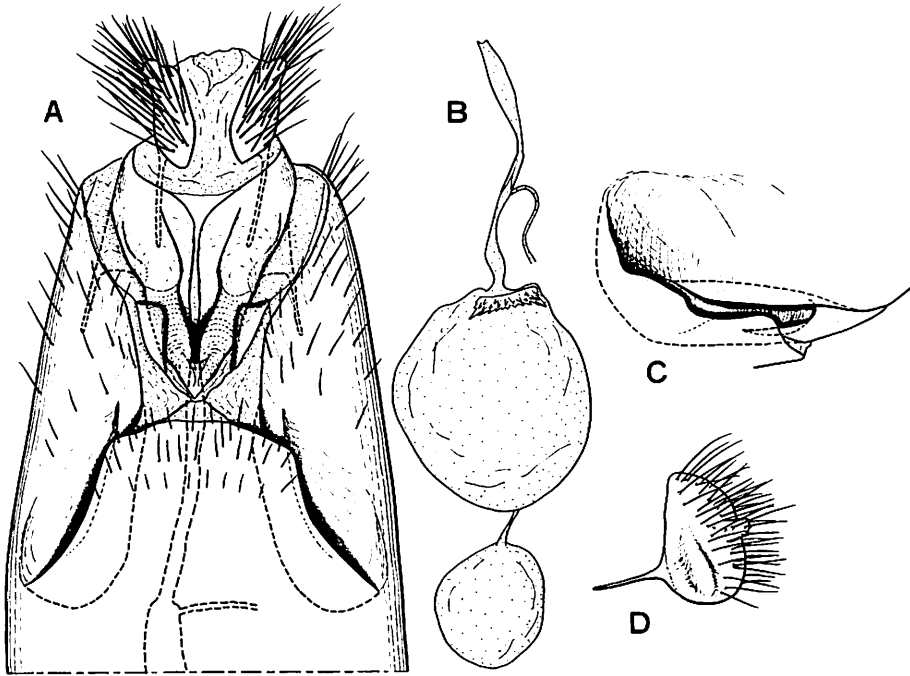


Fig. 17. Female genitalia of *Eurema tilaha tilaha* (HORSFIELD, 1829) from Java. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Lateral hollow (lateral). D: Papilla analis (lateral).

sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 17): Seventh abdominal sternum with nearly straight or slightly convex posterior margin. Lateral hollow elliptical, broadly expanding anteriorly, with dorsal eaves absent, ventral eaves long and deep, median groove with short and weak internal eaves, having a long median eaves situated ventral 1/2 of lateral hollow. Genital plate weakly invaginated ventromedially; longitudinal groove weakly sclerotized, very broad and deep, broadened posteriorly, with narrow longitudinal sulcus; banks of longitudinal groove developed, strongly compressed in its anterior half with numerous stipples regularly arranged. V-shaped wall undeveloped, but broad and somewhat angulate swelling produced either side of ostium bursae. Ostium bursae opening in the anterior portion of genital plate. Ductus bursae about 1.25 length of cervix bursae, membranous but weakly sclerotized on anterior 1/4. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly longer than apophysis posterioris, with a prominent protuberance at the outer margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: This species shows little variation in wing markings. The seasonal polyphenism is unknown.

Taxonomic remarks: The development of forewing black basal border is widely seen in *blanda*, *hecabe* and *alitha* from Mindanao, Sulawesi, Moluccas and Carolin Isls., but in the *tilaha* section the basal border is always present. In this connection, the classification of *tilaha* has been very confused. CORBET and PENDLEBURY (1933) misidentified 11 subspecies of *E. alitha* having the forewing black basal border with "*E. tilaha*" due to their superficial resemblance. HOLLOWAY (1978), however, transferred correctly these 11 subspecies to *alitha* based on male genital structure. Further, SHIRÔZU and YATA (1977, 1978) divided the previous "*tilaha*" into *tilaha* and *nicevillei*. After all, *tilaha* consists of only two subspecies, *tilaha* and *myria*.

Relationship: This species is most closely related to *nicevillei* and these two are inferred to form a monophyletic group with which *tominia* is united (the *tilaha* section).

Distribution: This species occurs in Java and Bali.

Habitat and habits: This rather rare and local butterfly seems to inhabit mainly mountainous forest (about 100–1000 m alt.), though it also occurs near the coast. According to MORINAKA's observation in Bali (YATA & MORINAKA, 1990), the butterfly usually keeps near the ground (below about 1 m from the ground).

Early stages: The early stages are unknown.

Eurema tilaha tilaha (HORSFIELD, 1829)

Terias tilaha HORSFIELD, 1829: 136. LECTOTYPE ♀ (Java) here designated. [BMNH, examined]

Terias tilaha tilaha HORSFIELD; FRUHSTORFER, 1910: 170, t. 73g. (E. & W. Java)

Eurema tilaha tilaha (HORSFIELD); CORBET & PENDLEBURY, 1932: 183.

The nominate subspecies is characterized by the following combination of characters.

Male (Pl. 23 (5–6)). *Upperside:* Forewing black costal border broad, with its inner margin sharply defined; black basal border broad, occupying space 1a throughout its length, with its inner margin weakly diffused in discoidal cell, having very narrow yellow veins in basal portion. Hindwing black anal border sometimes represented by scattered black scales continued along vein 1a to base. *Underside:* Markings more or less indistinct circular subbasal spots sometimes represented by small roundish dots. Forewing termen somewhat convex. **Female** (Pls. 23 (7–8), 24 (1–2)). *Upperside:* Forewing black distal and basal borders broad; hindwing black distal border broad. *Underside:* Most markings well defined.

Forewing length: Male, 17.5–24.0 mm (n=6, avg=21.3 mm, female 21.5–23.0 mm (n=2, avg=22.3 mm).

Type material examined: *Terias tilaha* was described from an unstated number of specimens from 'Java' by HORSFIELD. The BMNH now possesses a female specimen

which bears the labels: 'Type (red) / Java, 60.15 / Terias tilaha Horsf.' In addition the male bears the following labels; 'Lectotype (purple) / Terias tilaha Horsfield LECTOTYPE det. O. Yata 1990' and hereby designated lectotype.

Material studied: JAVA: Java, 2 ♂, (Nire) [KUFA], 1 ♂ [NSA]; Soekaboemi, 2 ♂ 1 ♀ (M. E. Malsh) [NSA], 1 ♀ (Dr. J. A. C.) [KUFA]; E. Java, Popoh, S. Coast, 1 ♂, 16. iii. 1958 (P. JACOULET) [OMNH]

Distribution: This subspecies is distributed from W. & E. Java.

Eurema tilaha myria (FRUHSTORFER, 1913)

Terias tilaha myria FRUHSTORFER, 1913: 92. Holotype ♂ (Bali). [BMNH, examined]

Eurema tilaha myria (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 183.

This subspecies is distinguishable from the nominate subsp. *tilaha* from Java by the following combination of characters.

Male (Pl. 24 (3–4)). Ground colour somewhat paler. *Upperside:* Forewing black costal border somewhat narrower, with its inner margin somewhat diffused; black basal border narrower, occupying 1/2–2/3 of space 1a, with its inner margin more strongly diffused in cell, having slightly broader yellow veins in basal portion. Hindwing black anal border represented by scattered black scales continued along vein 1a to base. *Underside:* Markings somewhat fainter; circular subbasal spots not reduced to small roundish dots. Forewing termen less convex. **Female** (Pl. 24 (5–6)). *Upperside:* Forewing black costal border somewhat narrower, with its inner margin somewhat diffused; black basal border slightly narrower, with its inner margin more strongly diffused in cell; black anal border more strongly diffused. *Underside:* Most markings somewhat fainter. Forewing termen less convex.

Forewing length: Male 21.0–23.5 mm (n=4, avg=22.5 mm), female 19.0–23.0 mm (n=4, avg=21.8 mm).

Type material examined: *Terias tilaha myria* was described from a male specimen from 'Bali' by FRUHSTORFER. The BMNH now possesses the holotype male which bears the labels: 'Type HT (red) / Type (red) / Gitagit? Bali / tilaha myria Fruhst. / Fruhstorfer Coll., B.M. 1937–285.' In addition the male bears the following labels; 'Lectotype (purple) / Terias tilaha myria Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype.

Material studied: BALI: Bali, Mt. Batukau (600 m), 1 ♂, 15. xii. 1973 (H. KURAHASHI); Denpasar, 1 ♂, 15. xii. 1973 (H. KURAHASHI); 1 ♂, 25. vii. 1985, 1 ♂, 27. iv. 1986 (MORINAKA); C. Bali, 1 ♀, i. vi. 1984, 1 ♀. 15. v. 1984 (MORINAKA); W. Bali, Gili Manuk, 1 ♀, 3. v. 1986, 1 ♀, 2. i. 1987 (MORINAKA) [KUCGE].

Distribution: This subspecies occurs only in Bali.

Eurema nicevillei (BUTLER, 1898)

[Pls. 24–26]

?Terias brigitta SNELLEN (nec CRAMER), 1880: 24.*Terias eumide* GROSE-SMITH (nec C. & R. FELDER), 1882: 336. (Sumatra)*Terias tilaha* DISTANT (nec HORSFIELD), 1885: 303, pl. 25, fig. 8, ♂.*Terias nicevillei* BUTLER, 1898: 79. (N. E. Sumatra)*Eurema nicevillei* BUTLER (YATA); 1980: 248.

Diagnosis: Basal part of basal border of forewing upperside with yellow veins; forewing upperside with uniform basal border in its inner edge near tornus; hindwing black distal border not continued to wing base; forewing underside with a cell spot; uncus short, with uncal projection well developed with its apex strongly bicuspid; P3 slender with blunt apex; P5 of valva much flattened with its apex distinctly incised; lateral hollow elliptical, broadly expanded anteriorly, median groove with broad and deep concavity; banks of longitudinal groove strongly compressed in its anterior half; well developed swelling produced either side of ostium bursae.

Description: Male. *Upperside:* Ground colour lemon yellow. Forewing black costal border broad, with its inner margin sharply defined; black distal border broad, with its inner edge oblique and irregular from costa to vein 4, much obtuse-angled at vein 4, usually much more deeply excavated in space 2 than in space 3; black basal border always well developed, occupying space 1a and 2/3–4/5 of 1b+c, with its inner margin almost uniform, having yellow veins in basal portion; discocellular spot absent; fringe black. Hindwing black distal border broad, becoming slightly broadened towards tornus, with its inner edge more or less waved; anal border sometimes represented by scattered black scales continued along vein 1a; fringe black. Basal portions of both wings blackish. *Underside:* Ground colour almost same as on upperside. Markings generally more or less faint and sometimes disappearing or barely traceable in submarginal series. Forewing with submarginal spots in spaces 4 to 9, sometimes appearing in space 3; a small faint spot in discoidal cell; discocellular marking appearing by an irregular slender ring, covering more than half of discocellular vein; tornal spot represented by an oblique streak, but sometimes disappearing; sex-brand reddish brown, long and narrow, ending slightly before origin of vein 2; vein-dots conjoined with black anticiliary line, sometimes very faint black dots appearing at marginal middle point of each space in addition to vein-dots; fringe black, mixed with yellow. Hindwing with a series of submarginal spots in spaces 1b+c to 8 arranged in an evenly curved line parallel to wing margin, and submarginal spot each in spaces 7 and 8 close to each other across vein 8, sometimes conjoined with each other, situated in midway between submarginal spots and discocellular spot; circular subbasal spots or roundish dots present each in spaces 1b+c and 7; a minute basal spot absent; discocellular spot almost same as in forewing, but longer; vein-dots almost same as in forewing; fringe yellow mixed with black. Ultraviolet reflectance on upperside: Almost absorbed, appearing entirely

black in UV-photos (Pl. 30 (3, upper)).

Both wings somewhat elongate. Forewing somewhat angulate at apex; distal margin more or less convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black, white-checked on ventral surface, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal line barely traceable along the lateral margin of abdominal terga.

Forewing length: 21.0–28.0 mm.

Female. Similar to male, but differing as follows. Ground colour paler. *Upperside*: Forewing black distal border slightly broader, with its inner edge more indistinct; black basal border broader, usually occupying almost the whole of spaces 1a and 1b+c, more broadly developed in discoidal cell; hindwing black distal border much broader, especially towards tornus, with its inner edge more strongly diffused; anal border always present, more strongly developed, sometimes occupying spaces 1a to 2 and basal half of discoidal cell. *Underside*: Tonal spot very well developed, streamline-shaped, extending towards base in space 1b+c. Ultraviolet reflectance on upperside: Weakly reflective on yellow area of forewing, but more diffused distally, appearing grey in UV-photos (Pl. 30 (3, lower)).

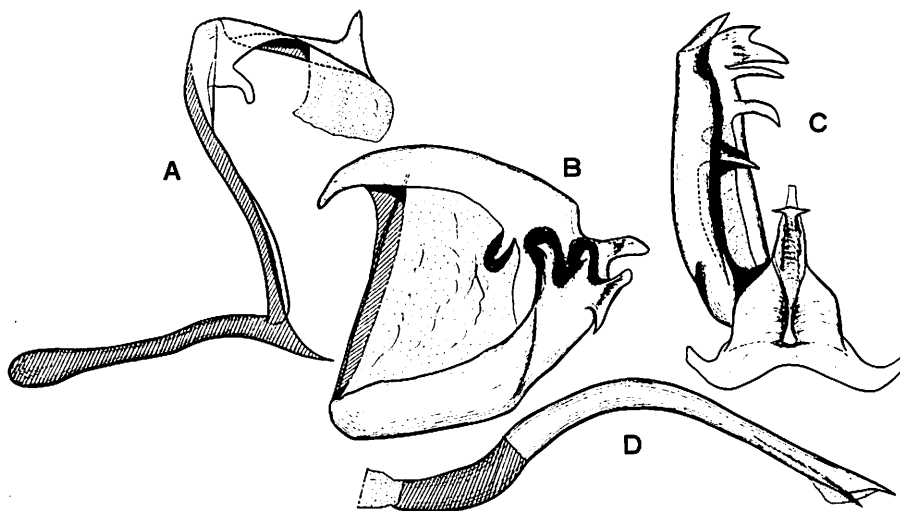


Fig. 18. Male genitalia of *Eurema nicevillei nicevillei* (BUTLER, 1898) from Sumatra. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

Forewing length: 21.5–27.0 mm.

Male genitalia (Fig. 18): Tegumen narrow, triangular in dorsal aspect, some-

what concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus fairly long (0.79–0.91 of ring height), angle between vinculum and saccus 80–90°. Uncus short (dorsum proper 0.55–0.73 of ring height), extending strongly downwards; uncal projection well projecting posterodorsally (0.21 of ring height), with its apex strongly bicuspid. Valva almost as long as high; P1 somewhat weakly sclerotized, shorter than P4, extending anteriorly; P2 absent; P3 slender, with its apex bluntly pointed; P4 represented by two processes which are almost same in length and shape, and their apices curved ventrally; P5 much flattened with its apex distinctly incised. Phallus long, slender and strongly arched dorsally, subzonal sheath about as long as 1/4 length of phallus or shorter. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

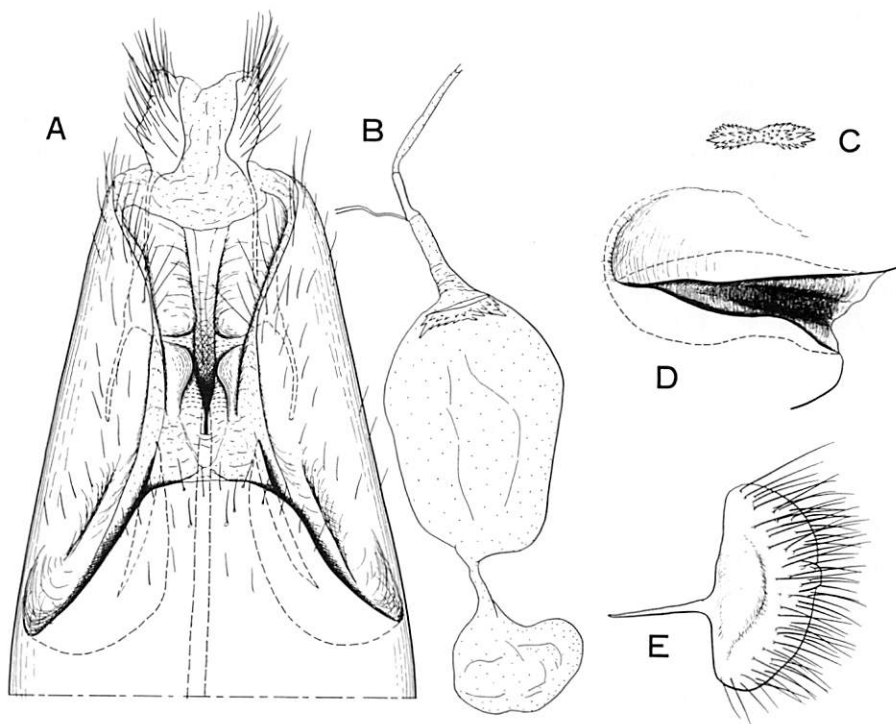


Fig. 19. Female genitalia of *Eurema nicevillei nicevillei* (BUTLER, 1898) from Langkawi Is. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Signum (anterior). D: Lateral hollow (lateral). E: Papilla analis (lateral).

Female genitalia (Fig. 19): Seventh abdominal sternum with nearly straight or slightly convex posterior margin. Lateral hollow elliptical, broadly expanding anteriorly, with dorsal eaves barely traceable, ventral eaves long and deep, median groove with broad and deep concavity, having a long median eaves situated ventral

1/2 of lateral hollow. Genital plate weakly invaginated ventromedially; longitudinal groove weakly sclerotized, broad and deep, broadened posteriorly, with narrow longitudinal sulcus; banks of longitudinal groove developed, strongly compressed in its anterior half with numerous stipples regularly arranged. V-shaped wall undeveloped, but broad and somewhat angulate swelling produced either side of ostium bursae. Ostium bursae opening in the anterior portion of genital plate. Ductus bursae about 1.25 length of cervix bursae, membranous but weakly sclerotized on anterior 1/4. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly longer than apophysis posterioris, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: This species shows little variation within Malaya, Borneo and Sumatra, but it does remarkable variation in Mentawi Isls. in wing markings. The seasonal polyphenism is unknown.

Taxonomic remarks: This species has been treated as a subspecies of *tilaha*, but as noted in previous section (*Eurema tilaha*), it was raised to the specific status because it differs constantly from *E. tilaha* in male and female genitalia as well as in wing markings.

Relationship: This species is most closely related to *E. tilaha* and these two are inferred to form a monophyletic group, with which *E. tominia* is united.

Distribution: This species occurs from S. Burma, the Malay Peninsula, Borneo, Sumatra and Mentawi Isls.

Habitat and habits: This local butterfly seems to inhabit mainly lowland forest, though it also occurs near the coast. HOLLOWAY (1973) reported that the habitats of this species were restricted to rather dry lowland forests in N. Borneo. MORISHITA (1970) and SHIMA (pers. com. in N. Borneo) observed that the butterflies flew with swiftness within lowland forest, where the direct sunlight hardly penetrated, and sometimes locally abundant.

Early stages: The early stages are unknown.

Eurema nicevillei nicevillei (BUTLER, 1898)

Terias nicevillei BUTLER, 1898: 79. LECTOTYPE ♂ (N. E. Sumatra) here designated. [BMNH, examined]

Terias tilaha nicevillei BUTLER; FRUHSTORFER, 1910: 170.

Eurema tilaha nicevillei (BUTLER); CORBET & PENDLEBURY, 1932: 182.

Eurema nicevillei nicevillei (BUTLER); YATA, 1980: 248.

The nominate subspecies is characterized as follows.

Male (Pls. 24 (7-8), 25 (1-4)). *Upperside:* Black distal border broad, with its inner edge oblique and irregular from costa to vein 4, much obtuse-angled at vein 4,

usually much more deeply excavated in space 2 than in space 3. Hindwing black distal border with its inner edge waved. *Underside*: Forewing with submarginal spots in spaces 4 to 9 not entirely disappearing; tornal oblique spot or streak usually present. Hindwing with circular subbasal spots or roundish dots usually well marked; submarginal spots usually present in spaces 1b+c to 9. Forewing with distal margin slightly convex. **Female** (Pl. 25 (5–8)). *Upperside*: Forewing black distal border with its inner edge much obtuse-angled at vein 4, not clearly and deeply excavated in space 3; black basal border occupying less than half of discoidal cell. Hindwing black anal border occupying less than half of discoidal cell.

Forewing length: Male 21.5–27.0 mm (n=16, avg=23.6 mm), female 21.5–25.5 mm (n=6, avg=23.0 mm).

Type material examined: *Terias nicevillei* was described from an unstated number of male and female specimens from 'N. E. Sumatra' by BUTLER. The BMNH now possesses a male and female specimens. The male specimen bears the labels: 'Type (red) / N. E. Sumatra / Watson. 97–193'. In addition the male bears the following labels; 'Lectotype (purple) / *Terias nicevillei* Butler LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels, and in addition the following labels; 'Paralectotype (blue) / *Terias nicevillei* Butler PARALECTOTYPE det. O. Yata 1990'.

Material studied: MALAY PENINSULA: 1 ♂, 16. xi. 1968 (TAKETANI) [OMNH], 1 ♀, 7. iv. 1969; Malay States, Perak, Federated, 1 ♂ (Mr. J. J. J.) [KUFA]; Lombong, 1 ♂, 17. iv. 1969 (G. NISHIMURA); W. Malaysia, 1 ♂, 4. iv. 1969; Langkawi Is., 2 ♂2 ♀, 6–9. v. 1974 (NAKAYAMA) [KUCGE]. N. BORNEO: Sarawak, Kuala Bok, 4 ♂, 27. ii–3. iii. 1969 (KUNOU & ARITA) [MUFA]; 2 ♂, Hot Spring, 30. vii. 1968 (S. HADA), 1 ♂, 12. viii. 1968 [OMNH]; Bali Ringgin, 2 ♂2 ♀, 22–24. xi. 1975 (SHINONAGA) [KUCGE]; Sabah, Polin, 1 ♂, 18. x. 1970 (YAMADA) [TUA]; Seplot, 1 ♂, 25. viii. 1968 (G. IMADATE) [NSA]; Sumparon, 1 ♂, 28. viii. 1968 [TUA]. SUMATRA: Danau, Toba (800–1200 m), 1 ♂, 25. xi. 1973; Kalo Hill, 1 ♀, 23. x. 1979 [KUCGE].

Distribution: This subspecies is distributed from S. Burma, the Malay Peninsula, Borneo and Sumatra.

Eurema nicevillei lamperti (FRUHSTORFER, 1912)

Terias tilaha lamperti FRUHSTORFER, 1912: 95. (Pulau Tello, Batu Isls.) [untraced]

Eurema tilaha lamperti (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 183.

Eurema nicevillei lamperti (FRUHSTORFER); Yata, 1980: 248.

This subspecies is distinguishable from the nominate subsp. *nicevillei* from Sumatra by the following combination of character.

Male (Pl. 26 (1–2)). *Upperside*: Black distal border narrower, with its inner edge oblique and much irregular from costa to vein 4, obtuse-angled at vein 4,

slightly more deeply excavated in space 2 than in space 3; black basal border slightly narrower. Hindwing black distal border with its inner edge more weakly waved. *Underside*: Forewing without submarginal spots and tornal spot; discoidal cell spot much fainter. Hindwing with circular subbasal spots fainter; submarginal spots fainter, disappearing in spaces 1b+c to 3. Forewing with distal margin more convex. **Female** (Pl. 26 (3-4)). *Upperside*: Forewing black distal border with its inner edge more angulate at vein 4, clearly and more deeply excavated in space 3; black basal border occupying more than half of discoidal cell. Hindwing black anal border occupying more than half of discoidal cell.

Forewing length: Male 22.0–28.0 mm (n=3, avg=24.7 mm), female 26.5–27.0 mm (n=2, avg=26.8 mm).

Material studied: MENTAWI ISLS., Siberut, 2 ♂ 1 ♀. xii. 1983; Muarasiberut, 1 ♂ 1 ♀, vi. 1980 [ET].

Distribution: This subspecies occurs in Mentawis (Batu and Siberut).

The *lacteola* subgroup

Eurema novapallida YATA, **nom. nov.**

[Pls. 26–27]

Eurema lacteola MÉTAYE (nec DISTANT); 1957: 69–106. (S. Vietnam)

Eurema pallida SHIRÔZU & YATA, 1973: 132–135, Pl. 7, 1–4. (preoccupied by *Terias pallida* CHAVANNES, 1849) Holotype ♂ (S. Vietnam). [KUCGE, examined]

Diagnosis: Ground colour greenish yellow in male and paler in female; black distal border on forewing upperside almost right-angled at vein 4, more deeply excavated in space 2 than in space 3; hindwing black distal border very narrow, often reduced to vein-dots; two spots in discoidal cell; uncus very long; P3 slender with pointed apex; P5 almost the same in length and shape as each process of P4; lateral hollow fairly elliptical; banks of longitudinal groove not distinctly excavated along each inner margin.

Description: **Male** (Pl. 26 (5–8)). *Upperside*: Ground colour greenish yellow. Forewing black costal border barely traceable with its inner margin much diffused, rarely disappearing; black distal border usually broad, with its inner edge oblique and irregular from costa to vein 4, almost right-angled at vein 4, more deeply excavated in space 2 than in space 3, usually inclined slightly towards base in spaces 1a and 1b+c; black basal border undeveloped; discocellular spot absent; fringe black. Hindwing black distal border very narrow, often reduced to marginal vein-dots which are sometimes conjointed with a catenate black anticiliary line; anal border undeveloped; fringe greenish yellow. Only extreme bases of both wings usually blackish. *Underside*: Ground colour somewhat paler than on upperside. Forewing usually with subapical streak much reduced to small faint spots in spaces 4 and 5; two faint spot in

discoidal cell, of which the basal one is sometimes omitted; discocellular marking appearing by an irregular slender ring, covering more than half of the discocellular vein; tornal spot absent; sex-brand reddish brown, short and narrow, ending slightly before a point of origin of vein 2; small vein-dots not conjoined with a black anteciliary line; fringe black but mixed with greenish yellow. Hindwing with a series of submarginal spots in spaces 1a to 8, arranged in an irregular zigzag-line, and a submarginal spot in spaces 7 and 8 bisinuate and directed towards the discocellular spot, sometimes conjoined with each other; circular subbasal spot present each in spaces 1b+c and 7 and in the middle of discoidal cell; a minute basal spot absent; discocellular spot almost same as in forewing; vein-dots not conjoined with a black anteciliary line; fringe greenish yellow, but often mixed with black. Ultraviolet reflectance on upperside: Almost absorbed, appearing entirely black in UV-photos (Pl. 30 (4, upper)).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing fairly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black and white-checked, except on the postero-dorsal surface and a few apical segments, club cylindrical. Thorax and abdomen greenish yellow, much darkened above, clothed with black and greenish yellow hairs on thorax and base of abdomen, a black longitudinal line appearing along the lateral margin of abdominal terga.

Forewing length: 18.5–22.5 mm ($n=10$, $\text{avg}=21.1$ mm).

Female (Pl. 27 (1–2)). Similar to male, but differing as follows. Ground colour pale greenish yellow. *Upperside*: Forewing with black costal border narrower, sometimes disappearing; inner edge of black distal border inclined slightly towards tornus. Ultraviolet reflectance on upperside: Almost absorbed, appearing dark grey in UV-photos (Pl. 51 (4, lower)).

Forewing length: 18.5–21.0 mm ($n=2$, $\text{avg}=19.8$ mm).

Male genitalia (Fig. 20): Tegumen narrow, triangular in dorsal aspect, somewhat concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus long (0.93 of ring height), angle between vinculum and saccus $80-90^\circ$. Uncus very long (dorsum proper 0.85–1.0 of ring height), extending strongly downwards; uncal projection short (0.09–0.15 of ring height) and almost triangular in lateral aspect, usually projecting posterodorsally, with its apex weakly bicuspid. Valva as long as high; P1 somewhat weakly sclerotized, much shorter than P4, extending almost laterally or somewhat anteriorly; P2 weakly produced and appearing as a protuberance; P3 slender, with a pointed apex; P4 represented by two processes which are almost same in length and shape, and their apices curved ventrally; P5 almost same in length and shape as each process of P4. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as $1/4$ length of phallus. Juxta weakly sclerotized, consisting of

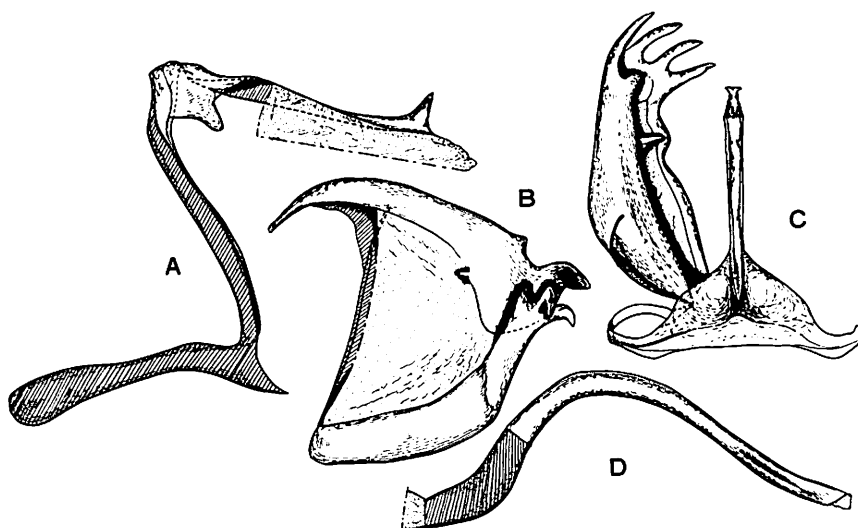


Fig. 20. Male genitalia of *Eurema novapallida* YATA, nom. nov. from S. Vietnam. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and yalva (dorsal). D: Phallus (lateral).

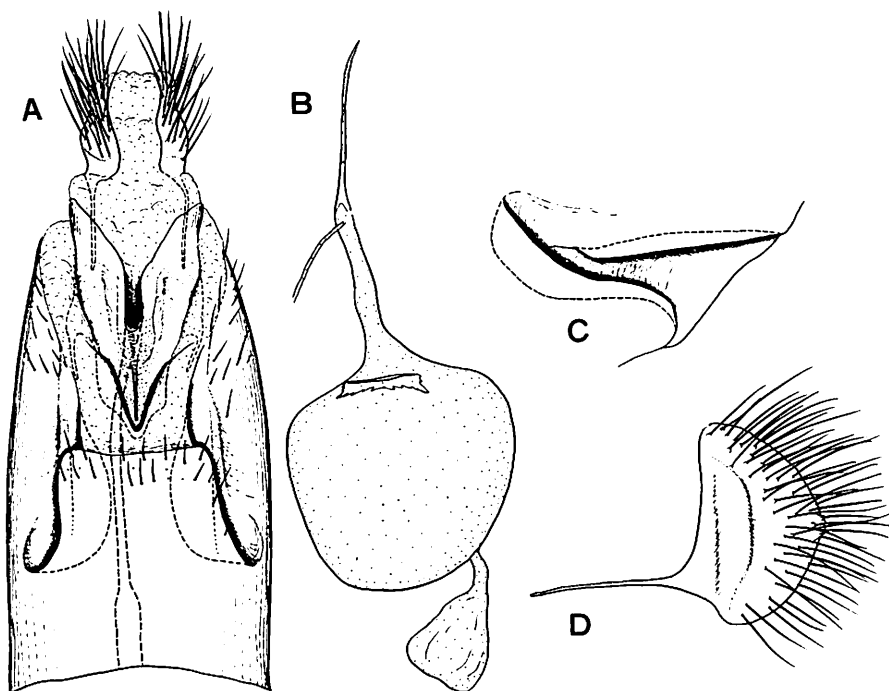


Fig. 21. Female genitalia of *Eurema novapallida* YATA, nom. nov. from Thailand. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Lateral hollow (lateral). D: Papilla analis (lateral).

a pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 21): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, without dorsal eaves, ventral eaves long and deep, median groove long, having a long eaves and situated ventral 1/2 of lateral hollow. Genital plate weakly invaginated ventromedially, obtuse-angled on its anterolateral corner in ventral aspect; longitudinal groove weakly sclerotized, broad and deep, parallel sided; banks of longitudinal groove developed, narrowed anteriorly, not excavated along each inner margin. V-shaped wall undeveloped. Ostium bursae opening near the middle of the genital plate. Ductus bursae about 1.25 length of cervix bursae, membranous but weakly sclerotized on anterior 1/4. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly longer than apophysis posterioris, with a prominent protuberance at the dorsal margin of proximal to subproximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: This species shows little variation even in wing markings. Sexual dimorphism is slightest within the *lacteola* subgroup. The seasonal polyphenism is unknown.

Type material examined: *Eurema pallida* was described from male and female specimens by SHIRÔZU and YATA. The holotype male specimen is now in KUCGE and bears the following labels; 'Bobla, S. Viet-Nam, 7. vii. 1962, S. Inoue / *Eurema pallida* Shirôzu & Yata, 1983 Holotype ♂ (red)'. The KUCGE and DBA also possesses 4 males, bearing similar data labels 'S. Viet-Nam, Bobla, 1 ♂, 17. v. 1962; Col de Blao, 1 ♂, 7. x. 1962 (S. INOUE); Thailand, Nakhon Ratchasima (2000–2600 ft.), 1 ♂, Chanthaburi, 1 ♂; (Paratype (orange))'.

Material studied: THAILAND: Doi Suthep, 2 ♂, 12. iv. 1977, 1 ♂, 21. iv. 1977; Chiang mai, 1 ♂, 26. iii. 1977; Chiang Dao, 1 ♂, 3. iii. 1982 (AKAYAMA); Pon Nahm Ron Chanthaluri, 1 ♂ 1 ♀, 29. iii. 1975 (YAMAGUCHI & AOKI) [KUCGE]. C. BURMA: Maymyo, 1 ♀, 12–16. iii. 1980 [ET]. INDIA?: 1 ♂ (EdwTOWen) [SI].

Taxonomic remarks: MÉTAYE (1957) first recorded this species from South Vietnam but regarded it as *lacteola*. SHIRÔZU and I originally described this species as *pallida* (SHIRÔZU & YATA, 1973). After publication, however, thanks to Drs. U. EITSCHBERGER and E. J. REISSINGER's advice, I noticed that *pallida* was a junior homonym. Therefore, I propose here new name *novapallida* for this homonym preoccupied by *Eurema pallida* (CHAVANNES, 1849).

Relationship: This species is most closely related to *lacteola-hiurai* complex and these two are inferred to form a monophyletic group, with which the *tilaha* subgroup is united.

Distribution: This species occurs in Indo-China (S. Vietnam, Thailand, Burma). Although one specimen preserved in the Smithsonian Institution (Washington) bears a label of "India", its occurrence is questionable.

Habitat and habits: This butterfly is rather rare and mainly inhabits mountain forests (about 700–1000 m alt.). The females are always much rarer than the males.

Early stages: The early stages are unknown.

***Eurema lacteola* (Distant, 1886)**

[Pls. 27–28]

Terias lacteola DISTANT, 1886: 466, fig. 129 ♀. (Singapore?)

Terias montivaga ROEPKE, 1935: 91, Pl. 10, fig. 16 ♂, 20 ♀. (Java)

Eurema lacteola (DISTANT); CORBET, 1941: 502. (Malaya, Sumatra & Java)

Diagnosis: Ground colour greenish yellow in male and milky-white in female; black distal border on forewing upperside almost right-angled at vein 4, more deeply excavated in space 2 than in space 3; a spot in discoidal cell; forewing underside without large apical patch; uncus fairly long; P3 of valva slender with pointed apex; P5 much flattened; lateral hollow fairly expanded posteriorly; banks of longitudinal groove not distinctly excavated along each inner margin.

Description: Male. Upperside: Ground colour greenish yellow, usually with reddish yellow tinge at basal portion of forewing and in spaces 6 and 7 of hindwing. Forewing black costal border usually somewhat broad with its inner margin moderately defined; black distal border broad, with its inner edge oblique and irregular from costa to vein 4, almost right-angled at vein 4, more deeply excavated in space 2 than in space 3, usually inclined slightly towards base in spaces 1a and 1b+c; black basal border undeveloped; discocellular spot absent; fringe black. Hindwing black distal border usually broad, tapering near apex and tornus, with its inner edge moderately defined, usually zigzag-shaped, rarely projected along each vein; anal border undeveloped; fringe black, mixed with greenish yellow, but sometimes entirely greenish yellow. Basal portions of both wings narrowly blackish. **Underside:** Ground colour somewhat paler than on upperside. Forewing usually with subapical streak represented by faint spots in spaces 5 to 9; a faint spot in discoidal cell; discocellular marking represented by an irregular slender ring, covering more than half of the discocellular vein; tornal spot absent; sex-brand reddish brown, short and narrow, ending slightly before a point of origin of vein 2; small vein-dots not conjoined with a black anticiliary line; fringe black but often mixed with greenish yellow. Hindwing with a series of submarginal spots in spaces 1a to 8, arranged in an irregular zigzag-line, and a submarginal spot in spaces 7 and 8 bisinuate and directed towards the discocellular spot, sometimes conjoined with each other; circular subbasal spot present each in spaces 1b+c and 7, and sometimes also in the middle of discoidal cell; a minute basal spot absent; discocellular spot almost same as in forewing, but larger; vein-dots not conjoined with a black anticiliary line; fringe greenish yellow, but often mixed with black. Ultraviolet reflectance on upperside: Structurally reflective on yellow areas which are diffused distally in forewing and

reduced posteriorly in hindwing, appearing bright-white in UV-photos. But, the reflective areas much reduced to basal portions of both wings in subsp. *varga* from Java and subsp. *baliensis* from Bali (Pl. 30 (5–7, upper)).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing fairly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black and white-checked, except on the postero-dorsal surface and a few apical segments, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and greenish yellow hairs on thorax and base of abdomen, a black longitudinal line sometimes appearing along the lateral margin of abdominal terga.

Forewing length: 21.0–24.5 mm.

Female. Similar to male, but differing as follows. Ground colour milky-white, on underside with greenish yellow tinge. *Upperside*: Forewing black costal border narrower, with its inner edge more strongly diffused; black distal border broader; hindwing black distal border slightly broader, with its inner edge more strongly diffused. *Underside*: Most markings generally fainter. Ultraviolet reflectance on upperside: Moderately reflective on milky-white area, appearing light grey in UV-photos (Pl. 30 (5–7, lower)).

Forewing length: 21.5–23.0 mm.

Male genitalia (Fig. 22): Tegumen narrow, triangular in dorsal aspect, some-

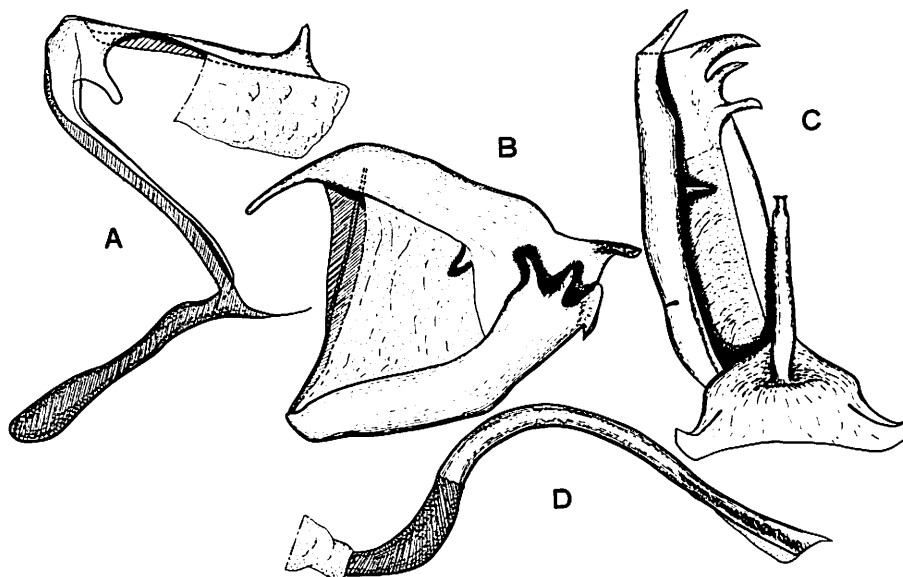


Fig. 22. Male genitalia of *Eurema lacteola lacteola* (DISTANT, 1886) from the Malay Peninsula.

A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

what concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus long, angle between vinculum and saccus $80-90^\circ$. Uncus fairly long, extending strongly downwards; uncal projection short and almost triangular in lateral aspect, usually projecting posterodorsally, with its apex weakly bicuspid. Valva longer than high, gradually narrowed posteriorly; P1 somewhat weakly sclerotized, much shorter than P4, extending almost laterally; P2 absent; P3 slender, with a pointed apex; P4 represented by two processes which are almost same in length and shape, and their apices curved ventrally; P5 much flattened and beak-shaped. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as $1/4$ length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

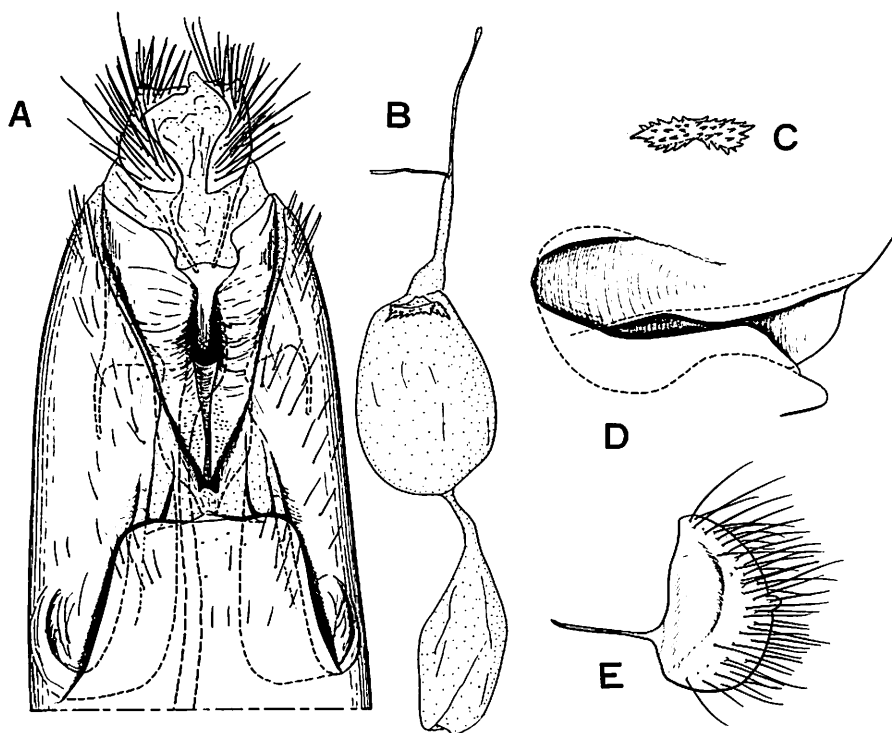


Fig. 23. Female genitalia of *Eurema lacteola lacteola* (DISTANT, 1886) from N. Borneo. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Signum (anterior). D: Lateral hollow (lateral). E: Papilla analis (lateral).

Female genitalia (Fig. 23): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, much expanded posteriorly, with dorsal eaves rather short and shallow, ventral eaves long and deep, median groove very long, having a long eaves and situated ventral $1/2$ of lateral hollow. Genital plate

weakly invaginated ventromedially, obtuse-angled on its anterolateral corner in ventral aspect; longitudinal groove weakly sclerotized, broad and deep, almost parallel sided; banks of longitudinal groove developed, narrowed anteriorly, not excavated along each inner margin. V-shaped wall undeveloped. Ostium bursae opening near the middle of the genital plate. Ductus bursae about 1.67 length of cervix bursae, membranous but weakly sclerotized on anterior 1/4. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly longer than apophysis posterioris, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: This species shows little variation within the Malay Peninsula, N. Borneo and Sumatra, while it varies remarkably in Java, especially in wing markings. The seasonal polyphenism is unknown.

Taxonomic remarks: The specific name of "*lacteola*" is derived from the whitish females which were once considered to be a white-form of *hecabe* (CORBET & PENDLEBURY, 1932; TALBOT, 1935, etc.). However, CORBET (1941) regarded "*lacteola*" as a distinct species occurring in the Malay Peninsula, Sumatra and Java based on its male genitalia. I tentatively follow this treatment, though not seen the type material of this species.

Relationship: This species is most closely related to *E. hiurai*, and the two species are inferred to form a monophyletic group, with which *novapallida* is united.

Distribution: This species has the broadest range within the *lacteola* subgroup. It occurs in Sundaland (Malaya, Borneo, Sumatra and Java).

Habitat and habits: This rather rare butterfly mainly inhabits mountainous forests (about 100–1000 m alt.). Generally it seems to be very local and rare. According to Morishita, for example, the habitats of this species are quite restricted in N. Borneo, and the best way for collecting is to wait at a favorable point. The females are usually much rarer than the males.

According to MORINAKA's observation in Bali (YATA & MORINAKA, 1990) the males and females fly rather high between about 1 to 10 m from the ground. In contrast, *Eurema tilaha* which can be frequently seen in the same place usually keeps near the ground (below about 1 m from the ground). The flight is fairly swift for *Eurema* species. The males and females are often observed to visit flowers (*Lantana*, etc.) for nectar.

Early stages: The early stages are unknown.

***Eurema lacteola lacteola* (DISTANT, 1886)**

Terias lacteola DISTANT, 1886: 466, fig. 129 ♀. (Singapore?) [untraced]

Eurema lacteola lacteola (DISTANT); CORBET & PENDLEBURY, 1956: 136., Pl. 35, fig. 46 ♂. (Malaya)

The nominate subspecies is distinguishable from other subspecies by the follow-

ing combination of characters.

Male (Pl. 27 (3–4)). *Upperside*: Ground colour greenish yellow with reddish yellow tinge at basal portion of forewing and in spaces 6 and 7 of hindwing. Forewing black costal border somewhat broad with its inner margin moderately defined. Hindwing black distal border usually broad, with its inner edge not distinctly projected along each vein; fringe black, mixed with greenish yellow. *Underside*: Most markings very indistinct; a small and faint spot in discoidal cell. Hindwing with a submarginal spot in spaces 7 and 8 bisinuate and directed towards the discocellular spot, but usually much before the discocellular spot; small circular subbasal spot absent in the middle of discoidal cell; fringe greenish yellow, mixed with black. Ultraviolet reflectance on upperside: Structurally reflective on most parts of yellow areas (Pl. 30 (5, upper)). **Female** (Pl. 27 (5–6)). *Upperside*: Hindwing black distal border much broader, with its inner edge more strongly diffused, not projected along each vein. *Underside*: Ground colour milky-white with pale greenish yellow tinge; most markings very indistinct; a small and faint spot in discoidal cell; a small circular subbasal spot very faint or absent in the middle of discoidal cell.

Forewing length: Male 21.0–24.5 mm (n=17, avg=22.6 mm), female 21.5–23.0 mm (n=4, avg=22.6 mm).

Material studied: MALAY PENINSULA: Taiping, 3 ♂, xii. 1972; Cameron Highland, 2 ♂, 1. v. 1972; Kg. Sahom, 1 ♂, 1. v. 1972 (NAKAYAMA) [KUCGE]. N. BORNEO: Sarawak, Kg Segu Bunuk, 1 ♂, 11. viii. 1968 (MORISHITA); Lohang, 1 ♂, 14. viii. 1964 (F. NAGAO) [NSA]; Sabah, Hot Spring, 2 ♂ [OMNH], 1 ♂, 15. vii. 1973; Sabah, Kundasang, 2 ♀, 21–24. viii. 1981; Mt. Kinabalu (1200 m), 2 ♀, 1. viii. 1971 (MORISHITA) [KUCGE]. SUMATRA: Kurui, 1 ♂, vii. 1979 (NISHIYAMA); Kalo Hill, Brastangi, 3 ♂, 22. ii 1987 [KUCGE].

Distribution: This subspecies occurs in the Malay Peninsula, Borneo and Sumatra.

Eurema lacteola varga (FRUHSTORFER, 1910)

Terias lacteola varga FRUHSTORFER, 1910: 179. Holotype ♂ (W. & S. Java). [BMNH, examined]

Eurema ada varga (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 177.

Terias montivaga montivaga ROEPKE, 1935: 91, Pl. 10, fig. 16 ♂, 20 ♀. (Java) [BMNH, Syntypes ♂ ♀, examined]

Terias ada varga (sic) FRUHSTORFER; TALBOT, 1939: 571.

Eurema lacteola montivaga (ROEPKE); YATA, 1981: 244.

This unique subspecies is easily distinguishable from the nominate subsp. *lacteola* from the Malay Peninsula by the following combination of characters.

Male (Pl. 27 (7–8)). *Upperside*: Ground colour paler greenish yellow. Forewing black costal border narrower. Hindwing black distal border much narrower,

with its inner edge more sharply defined, projected along each vein; fringe greenish yellow. *Underside*: Most markings more sharply defined; discoidal cell spot larger and zigzag-shaped. Hindwing with a submarginal spot in spaces 7 and 8 bisinuate, almost reaching the discocellular spot; circular subbasal spot present also in the middle of discoidal cell; fringe greenish yellow. Ultraviolet reflectance on upperside: Structurally reflective area much reduced at basal portions of both wings (Pl. 30 (6, upper)). **Female** (Pl. 28 (1–2)). *Upperside*: Hindwing black distal border much narrower, with its inner edge more sharply defined, projected along each vein. *Underside*: Ground colour milky-white with darker greenish yellow tinge; most markings usually more distinctly defined; discoidal cell spot larger and zigzag-shaped; circular subbasal spot present each in spaces 1 and 7, and in the middle of discoidal cell.

Forewing length: Male 21.0–23.0 mm (n=4, avg=22.0 mm), female 22.0–22.5 mm (n=2, avg=22.3 mm).

Type material examined: *Terias lacteola varga* was described from unstated male and female specimens by FRUHSTORFER. The holotype male specimen is now in the BMNH and bears the following labels; 'Type H T (red) / Type (red) / Java occident, Sukabumi, 2000' 1893, H. Fruhstorfer / *lacteola varga* Fr. / Fruhstorfer Coll, B.M. 1937–285.'

Material studied: JAVA: W. Java, Cirebon, Mt. Tjemere (400–1400 m), 1 ♂, 21. xi. 1973 (SHIMA); Tjibodas (1400 m), 1 ♂, 4. xi. 1972 [KUCGE]; C. Java: 1 ♂, ix. 1981 [KUCGE]; E. Java: Mt. Lawoe, 1 ♂2 ♀ (ROEPKE) [RNH].

Distribution: This subspecies occurs only in Java.

Eurema lacteola baliensis YATA & MORINAKA, 1990

Eurema lacteola baliensis YATA & MORINAKA, 1990: Holotype ♂ (Bali). [KUCGE, examined]

This subspecies is distinguishable from the nominate subsp. *lacteola* from the Malay Peninsula by the following combination of characters.

Male (Pl. 28 (3–4)). *Upperside*: Ground colour paler greenish yellow. Forewing black costal border slightly narrower; black distal border somewhat narrower, with its inner edge more roundly excavated in spaces 2 and 3, and zigzag-shaped in space 1. Hindwing black distal border usually much narrower, with its inner edge more sharply defined, projected along each vein; fringe greenish yellow. *Underside*: Most markings usually more sharply defined; forewing with discoidal cell spot usually larger and zigzag-shaped. Hindwing with a submarginal spot in spaces 7 and 8 bisinuate, almost reaching the discocellular spot; subbasal spot in discoidal cell faint or disappearing; fringe greenish yellow. Ultraviolet reflectance on upperside: Structurally reflective area much reduced at basal portions of both wings (Pl. 30 (7, upper)). **Female** (Pl. 28 (5–6)). *Upperside*: Ground colour almost pure-white;

black costal border more distinct; black distal border with its inner edge more deeply and roundly excavated in spaces 2 and 3, and zigzag-shaped in space 1 and from spaces 6 to 10. Hindwing black distal border broader, with its inner edge more sharply defined, projected along each vein; fringe whitish towards apex and tornus. *Underside*: Most markings more distinctly defined, especially in discoidal cell spot.

Forewing length: Male 21.0–23.5 mm (n=25, avg=21.8 mm), female 20.5–23.5 mm (n=18, avg=21.8 mm).

Taxonomic remarks: This subspecies is similar to subsp. *montivaga* from Java (Pls. 27 (7–8), 28 (1–2)), but distinguishable from the latter by the forewing black distal border with its inner edge zigzag-shaped in space 1, the hindwing black distal border broader, especially in female, and the almost pure-white ground colour on upperside of female.

Type material examined: *Eurema lacteola baliensis* was described from male and female specimens by YATA & MORINAKA. The holotype male specimen is now in the KUCGE and bears the following labels; 'Bali, Medewi, 3. i. 1990, Morinaka leg. / *Eurema lacteola baliensis* Yata & Morinaka, 1990, Holotype ♂ (red)'. The KUCGE, BZM, BMNH, KMNH, RNH, SI, and MORINAKA Coll. possess male and female specimens, bearing the following labels; 'W. Bali (Medewi, 1 ♂ 3 ♀, 3. i. 1990, Morinaka leg.; Munduk Tumpeng, 1 ♂ 1 ♀, 20. x. 1987; near Pulukan, 1 ♀, 6. vi. 1989, 1 ♀, 15. vi. 1989, 1 ♀, 23. xii. 1989; G. Lalang (600 m), 8 ♂ 4 ♀, 2–3. v. 1990, Morinaka leg.; 1 ♂, 9. vi. 1989, 1 ♂, 13. i. 1990, 1 ♂, 14. i. 1990 (KMNH IR 100,317 ~319), 7 ♂, 14. i. 1990, 1 ♂ 1 ♀, 27. i. 1990, 1 ♀, 28. i. 1990, 1 ♀, 5. iii. 1990, (KMNH IR 100,320) 1 ♀, 7. iv. 1990, 2 ♂, 19. iv. 1990), Paratype (orange); C. Bali (Bedugul (1000 m), 1 ♂, 12. vii. 1987; Lake Buyan (1100 m), 1 ♂ 1 ♀, 1. i. 1990, Morinaka leg.; 1 ♀, 20. v. 1989, 1 ♀, 8. x. 1989), Paratype (orange)'.

Distribution: This subspecies occurs only in Bali.

Eurema hiurai SHIRÔZU & YATA, 1977

[Pls. 28–29]

Eurema hiurai SHIRÔZU & YATA, 1977: 343–347. (Mindanao)

Diagnosis: Ground colour yellow in male and milky-white in female; black distal border on forewing upperside more deeply excavated in space 2 than in space 3; a small spot in discoidal cell; forewing underside of female with large, quadrate and black apical patch; a submarginal spot in spaces 7 and 8 not bisinuate but roundish spot; vein-dots much reduced; uncus moderately long; P1 of valva much reduced; P3 almost triangular with sharply pointed apex; P5 much flattened; lateral hollow much expanded posteriorly; banks of longitudinal groove distinctly excavated along each inner margin.

Description: **Male**. *Upperside*: Ground colour yellow. Forewing black cos-

tal border somewhat broad with its inner margin moderately defined; black distal border, broad, with its inner edge oblique and irregular from costa to vein 4, almost right-angled at vein 4, more deeply excavated in space 2 than in space 3, inclined slightly towards tornus or almost perpendicular to hind margin in spaces 1a and 1b+c; black basal border undeveloped; discocellular spot absent; fringe black. Hindwing black distal border usually broad, tapering near apex and tornus, with its inner edge moderately defined and almost uniform; anal border undeveloped; fringe black. Basal portions of both wings narrowly blackish. *Underside*: Ground colour somewhat paler than on upperside. Most markings rather diffused; forewing with faint subapical patch sometimes represented by faint spots in spaces 4 and 5; a small and faint spot in discoidal cell; discocellular marking appearing by an irregular slender ring, but divided into an upper and a lower parts, covering more than half of the discocellular vein; tornal spot absent; sex-brand pale reddish brown, short and narrow, ending slightly before a point of origin of vein 2; small vein-dots much reduced and barely traceable; fringe black. Hindwing with a series of submarginal spots in spaces 1b+c to 8, arranged in an irregular zigzag-line, and a submarginal spot in spaces 7 and 8 rather large and roundish; subbasal dot present each in spaces 1b+c and 7; a minute basal spot absent; discocellular spot almost same as in forewing; vein-dots much reduced and barely traceable; fringe black, but mixed with yellow. Ultraviolet reflectance on upperside: Structurally reflective on yellow areas except for tornal to anal region of hindwing, but sometimes diffused distally, appearing bright-white in UV-photos (Pl. 30 (8-9, upper)).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing fairly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black and white-checked, except on posterodorsal surface and a few apical segments, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal line sometimes appearing along the lateral margin of abdominal terga.

Forewing length: 21.0–24.0 mm.

Female. Similar to male, but differing as follows. Ground colour milky-white and on underside usually with greenish yellow tinge marginally and basally. *Upperside*: Forewing with black costal border narrower, with its inner edge more strongly diffused; black distal border slightly broader, with its inner edge more deeply excavated in spaces 2 and 3, always inclined towards tornus; hindwing black distal border sometimes narrower, with its inner edge sometimes more strongly diffused. *Underside*: Most markings generally fainter; forewing with large, quadrate and almost entirely dark brown covering the whole of apical area; small tornal spot usually present. Ultraviolet reflectance on upperside: Almost moderately reflective on milky-white area, appearing light grey in UV-photos (Pl. 30 (8–9, lower)).

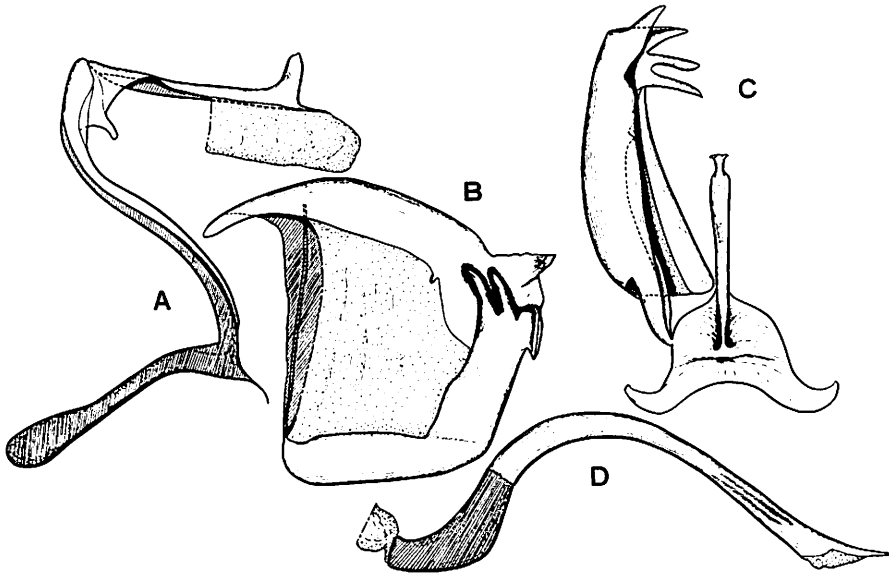


Fig. 24. Male genitalia of *Eurema hiurai hiurai* Shirôzu & YATA, 1977 from Mindanao. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

Forewing length: 23.0–26.0 mm.

Male genitalia (Fig. 24): Tegumen narrow, triangular in dorsal aspect, somewhat concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum sometimes strongly arched; saccus moderately long (0.73 of ring height), angle between vinculum and saccus 80–90°. Uncus moderately long (dorsum proper 0.7 of ring height), extending strongly downwards; uncal projection rather developed (0.17–0.19 of ring height), “temple bell”-shaped in lateral aspect, usually projecting postero- dorsally, with its apex weakly bicuspid. Valva as long as high, almost quadrate in lateral aspect, with its ventral margin obtusely angulate at the middle; P1 much reduced; P2 absent; P3 almost triangular, sharply pointed at apex, with weak serration on its dorsal margin; P4 represented by two processes which are almost same in length and shape, and their apices curved ventrally; P5 much flattened and beak-shaped. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as 1/4 length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 25): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, much expanded posteriorly, with shallow dorsal eaves conjointed with ventral eaves long and deep, median groove long and broad, having a long eaves and situated ventral 1/2 of lateral hollow. Genital

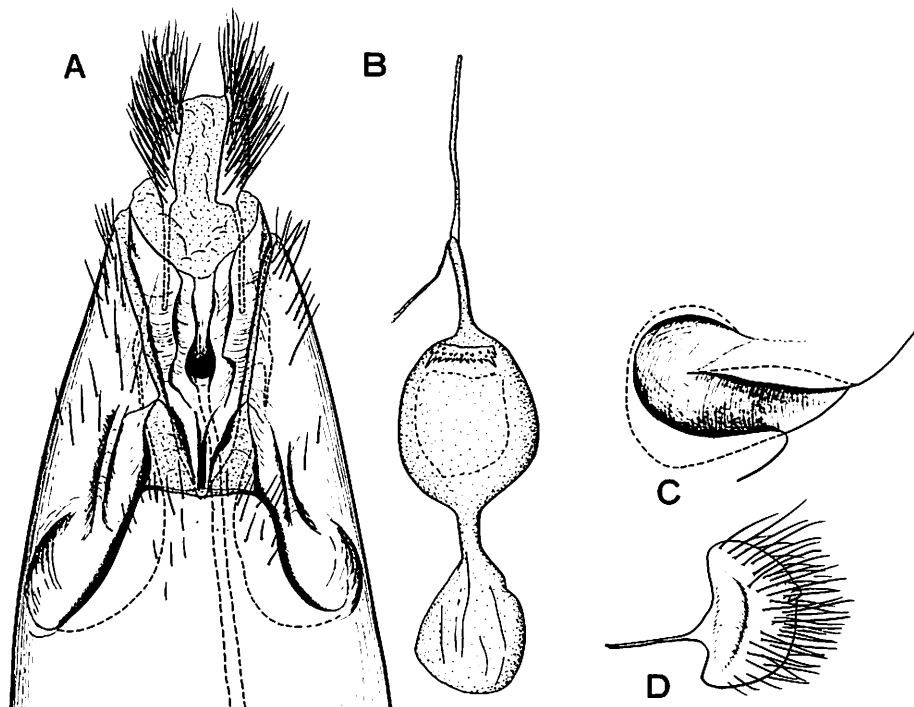


Fig. 25. Female genitalia of *Eurema hiurai hiurai* SHIRÔZU & YATA, 1977 from Mindanao. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Lateral hollow (lateral). D: Papilla analis (lateral).

plate weakly invaginated ventromedially, much obtuse-angled on its anterolateral corner in ventral aspect; longitudinal groove weakly sclerotized, broad and deep, narrowed in the middle; banks of longitudinal groove developed, narrowed anteriorly, irregularly excavated along each inner margin. V-shaped wall undeveloped. Ostium bursae opening near the middle of the genital plate. Ductus bursae about 1.67 length of cervix bursae, membranous but weakly sclerotized on anterior 1/4. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly hamulate upwards at the tip and longer than apophysis posterioris, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: Sexual dimorphism is very distinct. The females of this species, at first glance, very closely resemble *E. sari* in bearing the large blackish brown apical patch on the forewing underside. However, I identified these specimens as females of *E. hiurai* for the following reasons: 1) The wing markings are very similar to those of male of *hiurai* other than in bearing the apical patch of forewing underside. 2) The ground color of milky-white is also seen in the female of *E. lacteola* which is very

closely related to *hiurai*. 3) They were collected at the same place and time with *hiurai* (SHIRÔZU & YATA, 1977). This species does not show considerable variation, especially in males. The seasonal polyphenism is unknown.

Taxonomic remarks: This species was discovered from Mindanao, and then recorded as a subspecies of *Eurema lacteola* by HIURA and ALAGAR (1974) without any new subspecific name. After carefully examining the general appearance and male and female genitalia, we concluded that the "*lacteola*" from Mindanao represent a distinct new species which has never been described (SHIRÔZU & YATA, 1977).

Relationship: This species is most closely related to *E. lacteola* and these two species are inferred to form a monophyletic group, with which *novapallida* is united.

Distribution: This species occurs in Mindanao and N. Luzon.

Habitat and habits: This butterfly is rather rare and mainly inhabits mountainous forests (about 1000 m alt.). According to HIURA (pers. comm.) its habitat in Mindanao is forest clearings just made by lumbering and subsequent burning off, where low-growing forest undergrowth and forest edge vegetation still remain. KASHIWAI regards the species as a forest dweller at Kolepo river (north-eastern district of Mt. Apo, Mindanao) (pers. comm.).

Early stages: The early stages are unknown.

Eurema hiurai hiurai SHIRÔZU & YATA, 1977

Eurema hiurai SHIRÔZU & YATA, 1977: 343–347. Holotype ♂ (Mindanao) [OMNH, examined]

Eurema hiurai hiurai SHIRÔZU & YATA; YATA, 1981: 246.

The nominate subspecies is characterized by the following combination of characters.

Male (Pls. 28 (7–8), 29 (1–2)). **Upperside:** Forewing black distal border with its inner edge slightly more obtusely angled at vein 4. Ultraviolet reflectance on upperside: Structurally reflective on yellow areas except for tornal to anal region of hindwing. **Female** (Pl. 29 (3–4)). Forewing termen almost evenly rounded, not distinctly convex in each space. Ground colour on underside milky-white with greenish yellow tinge marginally and basally. **Upperside:** Hindwing black distal border rather broad; fringe black sometimes mixed with milky-white. **Underside:** Most markings fainter.

Forewing length: Male 21.0–23.0 mm (n=2, avg=22.0 mm), female 23.0–24.5 mm (n=5, avg=23.7 mm).

Type material examined: *Eurema hiurai* was described from male and female specimens by SHIRÔZU and YATA. The holotype male specimen is now in the OMNH and bears the following labels; 'Philippines: Mindanao, Palan-Capatagan, alt. 1000–1100 m, Davao del Sul, November 26 1969 / Philippine Survey '69, Osaka Mus. Nat. Hist. & National Mus., Philip., Isamu Hiura leg. / No. 50, sari-like sp. /

Property of Osaka Museum of Natural History Japan / PN.601 / *Eurema hiurai* Shirôzu & Yata, 1982 Holotype ♂ (red)'. The OMNH also possesses the following paratypes, bearing similar data labels, 'Mindanao, Palan-Capatagan (1000–1100 m), 1 ♂, 26. xi. 1969; Sisinon-Palan (800–1000 m); Mt. Malingdang (1550 m), 1 ♀; Capatagan (1100 m), 1 ♂, 1–2. xii. 1969; Upper Sibulan-Todaya (450 m), 1 ♀, 7–14. xii. 1969, Cutierrez & Reynoso leg. (Paratype (orange))'.

Material studied: MINDANAO: Malingdang (1550 m), 1 ♀, 4. viii. 1981 (TREADAWAY) [KUCGE]; C. Mindanao, Malitbag, Bukidon, 1 ♂, i-ii. 1979 [ET]; Calinan, Sinoda (Buda), 1 ♀, iv. 1981 [KUCGE].

Distribution: This subspecies is known only from Mindanao.

Eurema hiurai admiranda MORISHITA, 1981

Eurema hiurai admiranda MORISHITA, 1981: 6, fig. 1, 9 & 10. Holotype ♂ (Luzon). [ET, examined]

This subspecies is distinguishable from the nominate subsp. *hiurai* from Mindanao by the following combination of characters.

Male (Pl. 29 (5–6)). *Upperside*: Forewing black distal border with its inner edge somewhat acutely angled at vein 4, somewhat more deeply excavated in spaces 2 and 3, inclined slightly towards tornus. Ultraviolet reflectance on upperside: Structurally reflective on yellow areas except for tornal to anal region of hindwing, but diffused distally on forewing. **Female** (Pl. 29 (7–8)). Forewing termen convex in each space below vein 6. *Upperside*: Hindwing black distal border much narrower, represented by a catenate anticiliary line; fringe milky-white mixed with black. *Underside*: Ground colour milky-white, almost not tinged with greenish yellow tinge; most markings more distinctly defined; forewing black apical patch more broadly developed.

Forewing length: Male 24.0 mm (holotype), female 26.0 mm.

Type material examined: *Eurema hiurai admiranda* was described from a male and a female specimens by MORISHITA. The holotype male specimen is now in ET and bears the following labels; '1980. Apr., near Baguio, Luzon Is. / *Eurema hiurai admiranda* Morishita, 1981 Holotype ♂ (red) / PN.685'. The ET also possesses 1 paratype female, bearing the following data labels '1978. v. early, Asin Hot spring, Luzon (Paratype (red)) / PN.686 / 1039'.

Distribution: This subspecies is known only from N. Luzon.

(to be continued)

A Revision of the Old World Species
of the Genus *Eurema* HÜBNER
(Lepidoptera, Pieridae)

Part III. Description of the *sari*
group (part)

Osamu YATA

Plates 1–30.

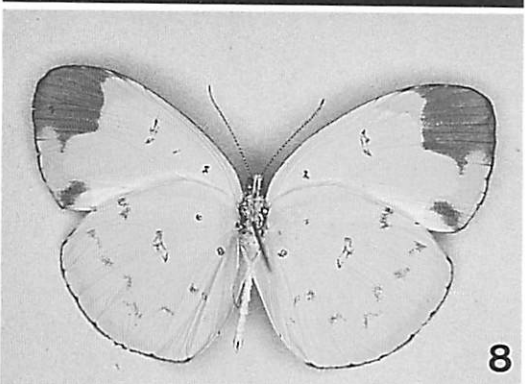
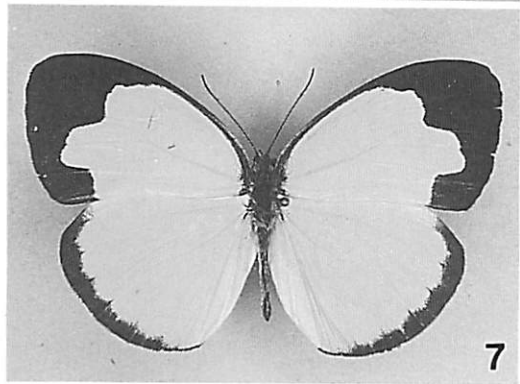
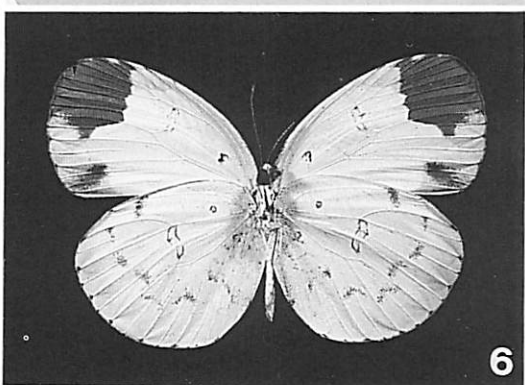
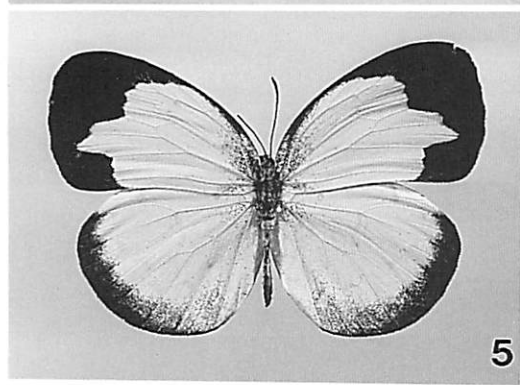
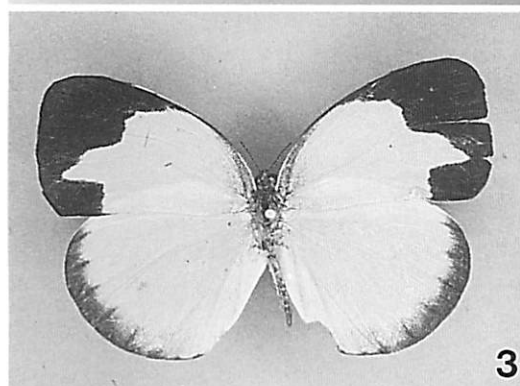
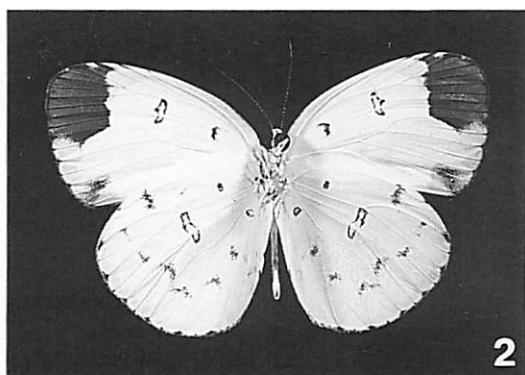
Explanation of Plate 1

Eurema sari sari (HORSFIELD, 1829) [P. 5]

1. ♂. Java.
2. Ditto, underside.
3. ♀, holotype [BMNH]. Java.
4. Ditto, underside.
5. ♀. Java.
6. Ditto, underside.

Eurema sari thyreus (FRUHSTORFER, 1910) [P. 6]

7. ♂, lectotype [BMNH]. Engano Is.
8. Ditto, underside.



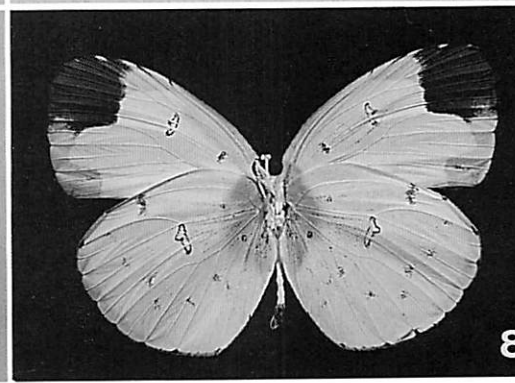
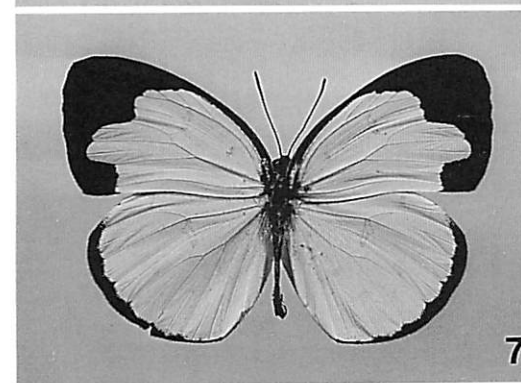
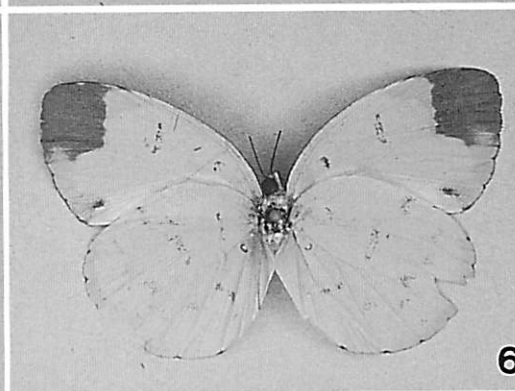
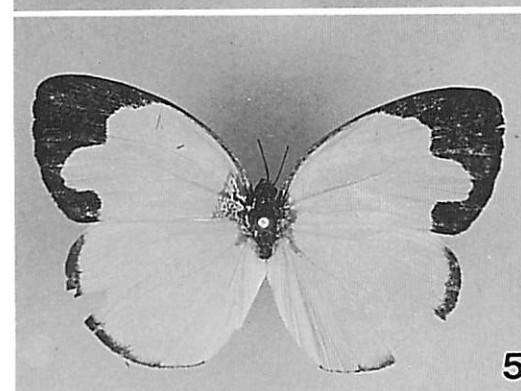
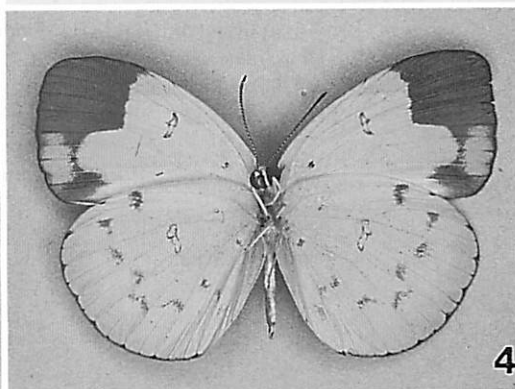
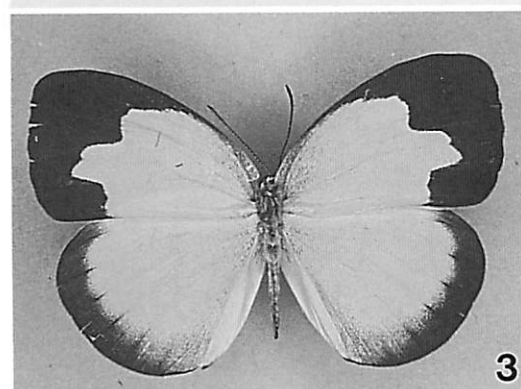
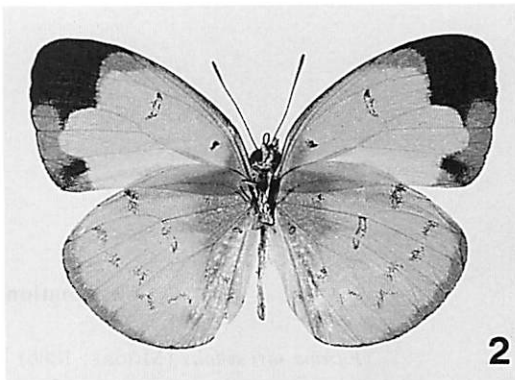
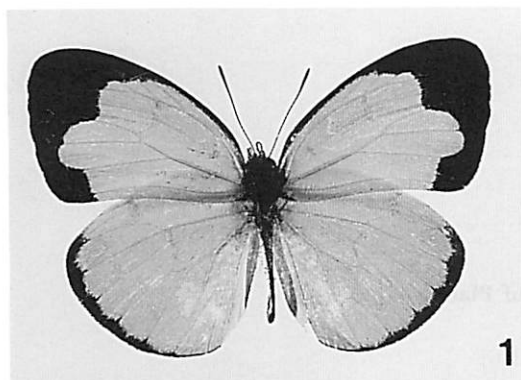
Explanation of Plate 2

Eurema sari thyreus (FRUHSTORFER, 1910) [P. 6]

1. ♂. Engano Is.
2. Ditto, underside.
3. ♀, paralectotype [BMNH]. Engano Is.
4. Ditto, underside.

Eurema sari sodalis (MOORE, 1886) [P. 6]

5. ♂, lectotype [BMNH]. Mergui.
6. Ditto, underside.
7. ♂. Malay Peninsula.
8. Ditto, underside.



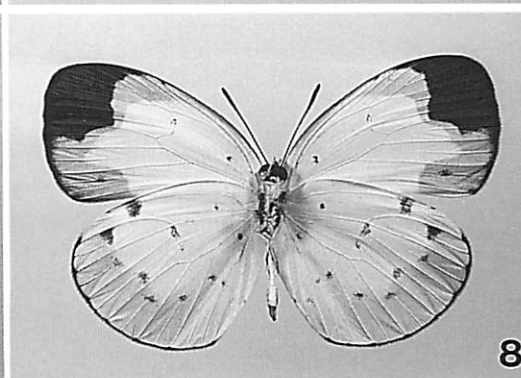
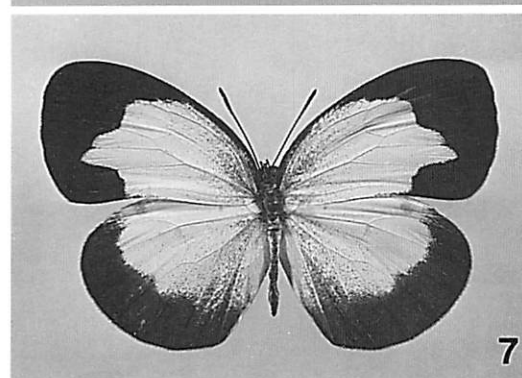
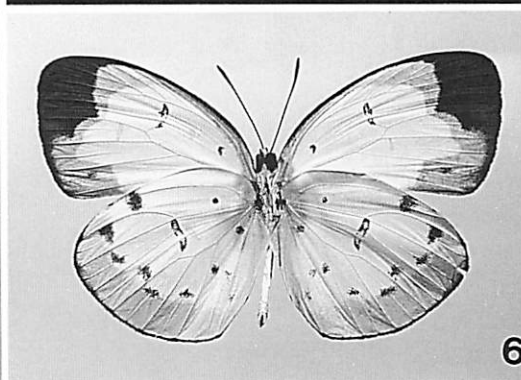
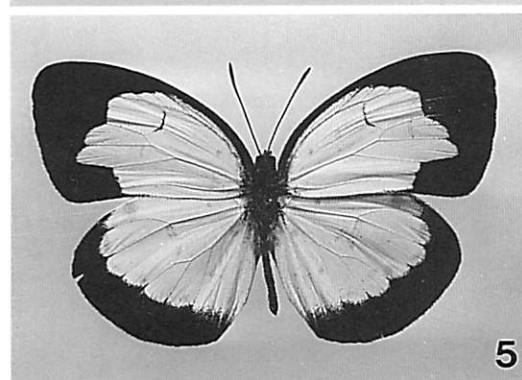
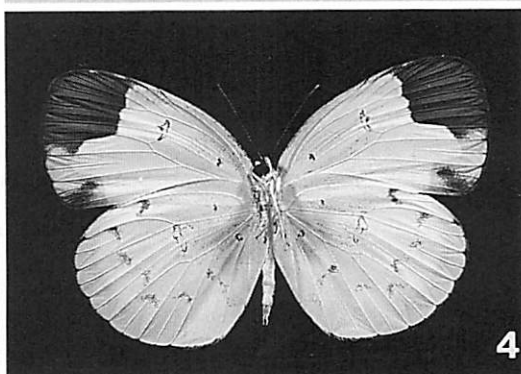
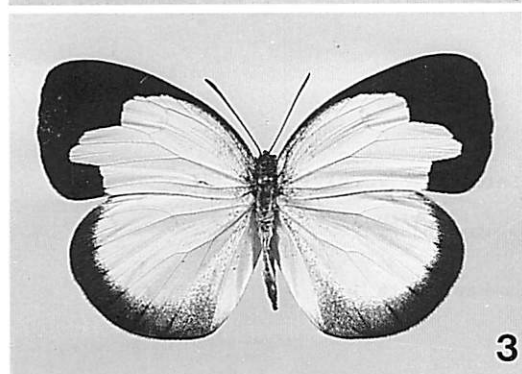
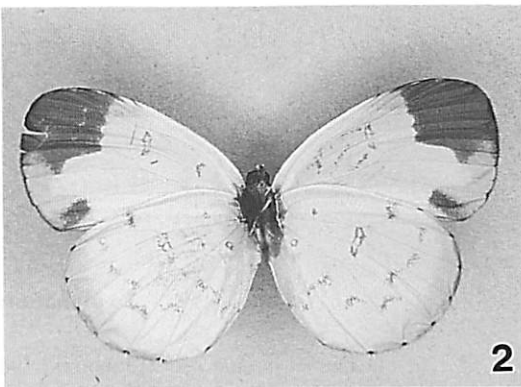
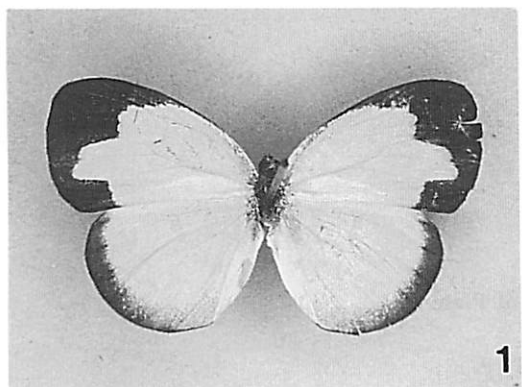
Explanation of Plate 3

Eurema sari sodalis (MOORE, 1886) [P. 6]

1. ♀, paralectotype [BMNH]. Mergui.
2. Ditto, underside.
3. ♀. Malay Peninsula.
4. Ditto, underside.

Eurema sarilata sarilata (SEMPER, 1891) [P. 11]

5. ♂. Mindanao.
6. Ditto, underside.
7. ♀. Mindanao.
8. Ditto, underside.



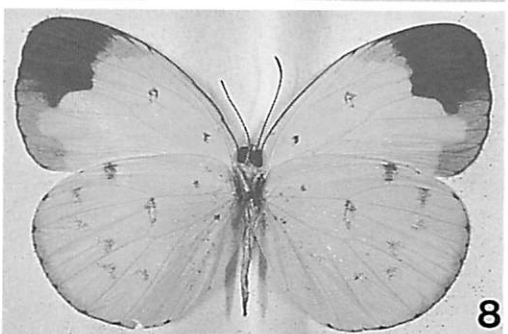
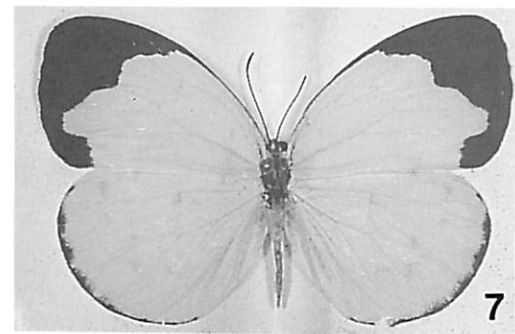
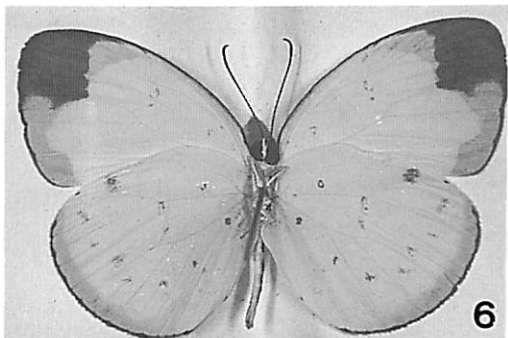
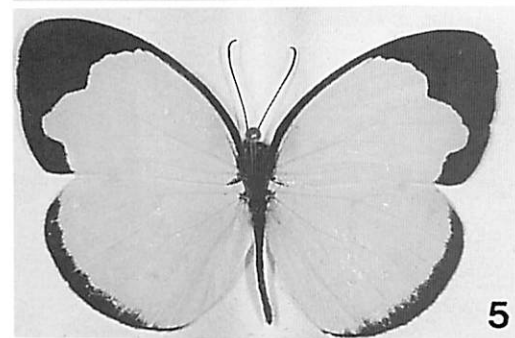
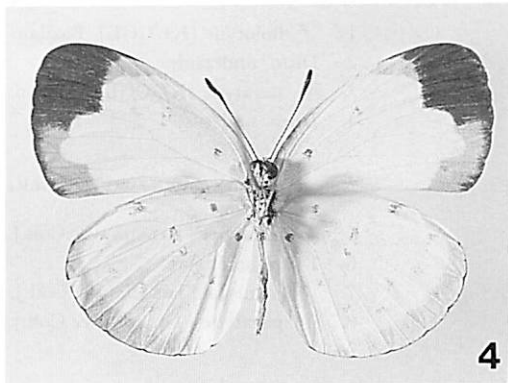
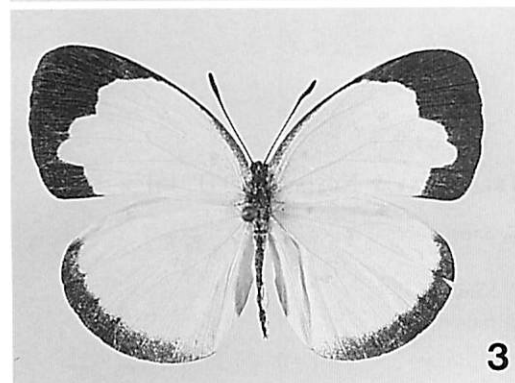
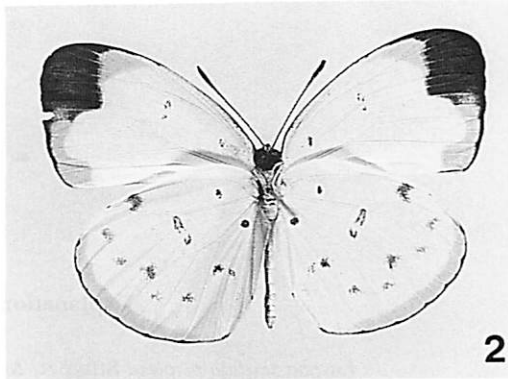
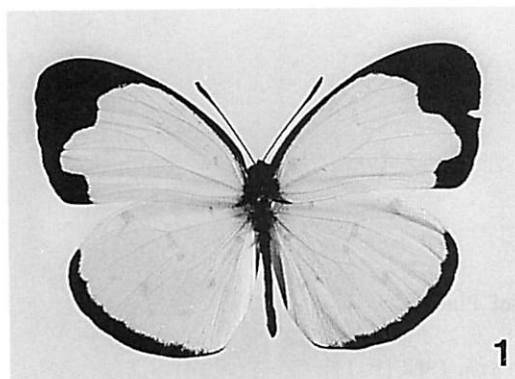
Explanation of Plate 4

Eurema sarilata risa MORISHITA, 1981 [P. 12]

1. ♂, holotype [ET]. Negros.
2. Ditto, underside.
3. ♀, paratype [ET]. Negros.
4. Ditto, underside.

Eurema sarilata dayani SCHROEDER, TREADAWAY & NUYDA, 1990 [P. 13]

5. ♂, holotype [TREADAWAY Coll.]. Tawitawi, Sanga Is.
6. Ditto, underside.
7. ♀, paratype [TREADAWAY Coll.]. Tawitawi, Sanga Is.
8. Ditto, underside.



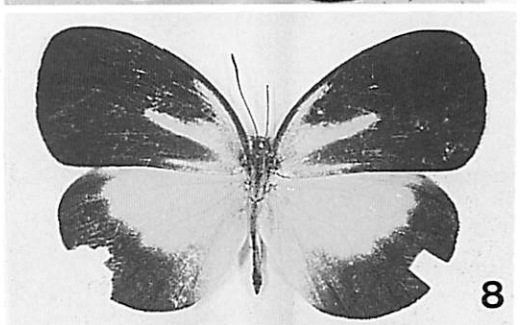
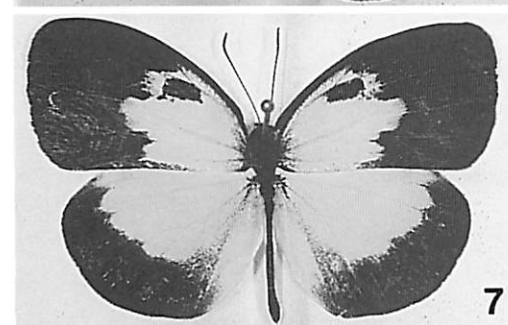
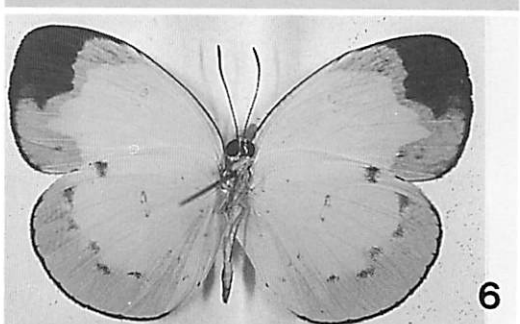
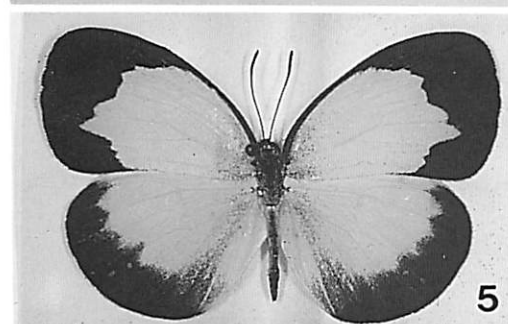
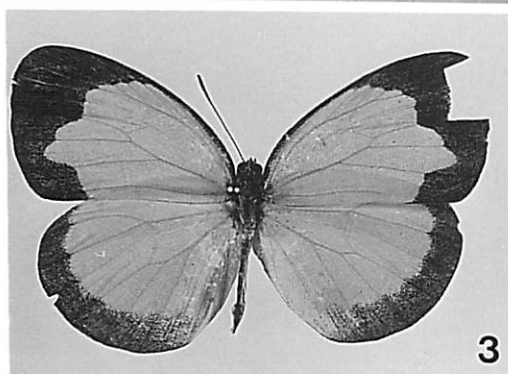
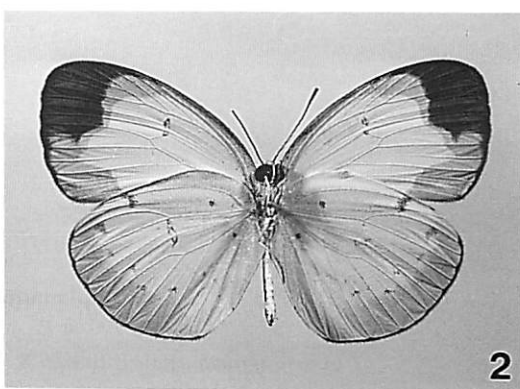
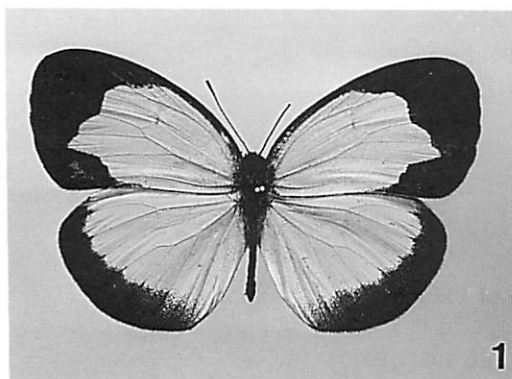
Explanation of Plate 5

Eurema sarilata perplexa SHIRÔZU & YATA, 1982 [P. 14]

1. ♂, holotype [KUCGE]. Bazilan.
2. Ditto, underside.
3. ♀, paratype [KUCGE]. Bazilan.
4. Ditto, underside.

Eurema sarilata rosario SCHROEDER, TREADAWAY & NUYDA, 1990 [P. 15]

5. ♀, paratype [TREADAWAY Coll.]. E. Samar.
6. Ditto, underside.
7. ♂, holotype [TREADAWAY Coll.]. E. Samar.
8. ♀, paratype [TREADAWAY Coll.]. E. Samar.



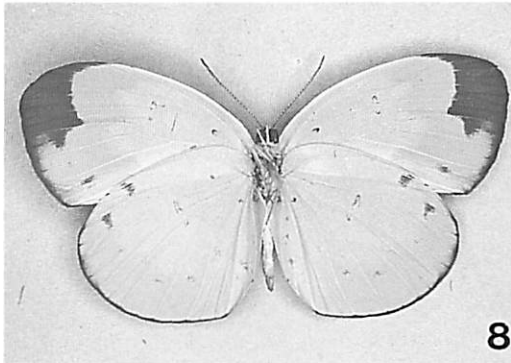
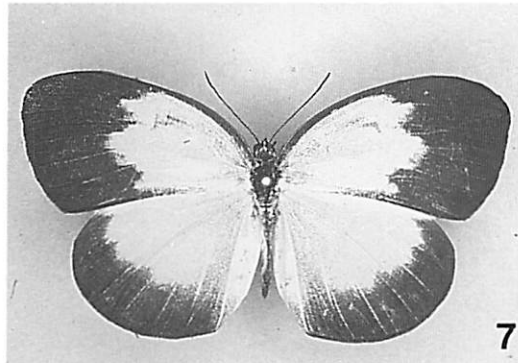
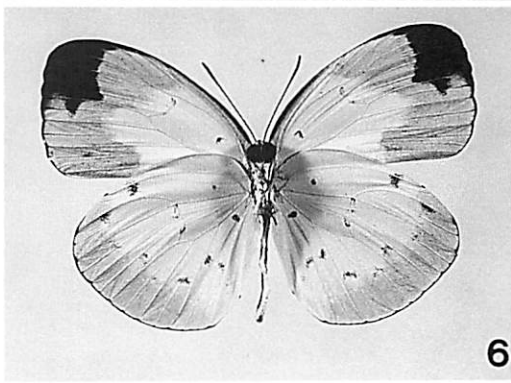
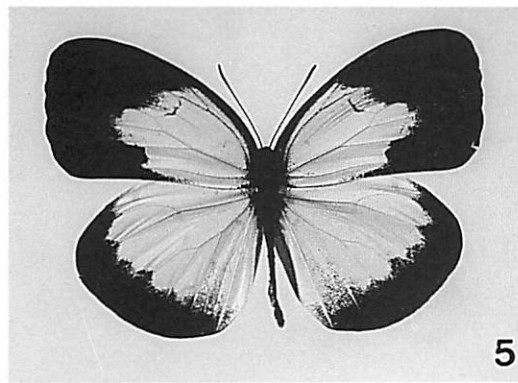
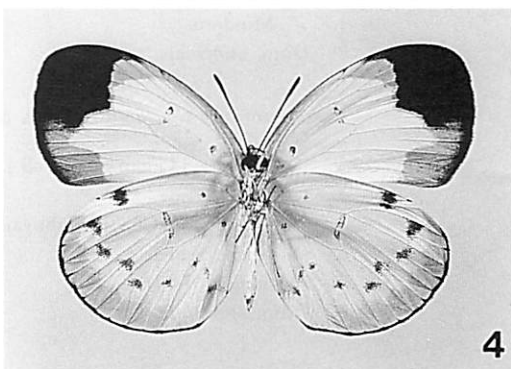
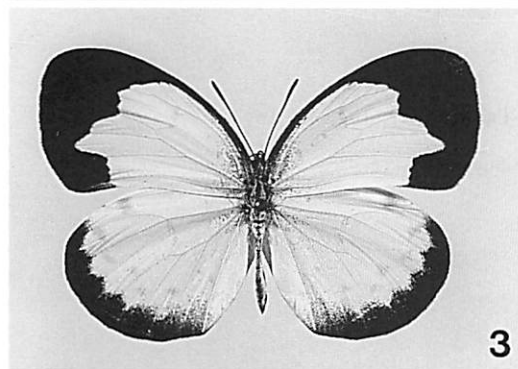
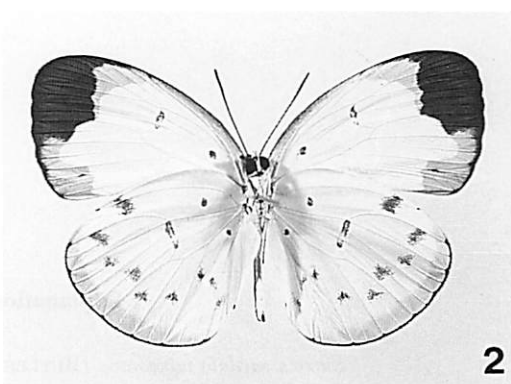
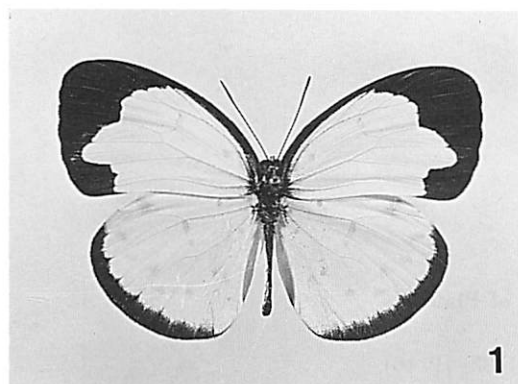
Explanation of Plate 6

Eurema sarilata aquilo SHIRÔZU & YATA, 1982 [P. 17]

1. ♂, holotype [KUCGE]. Luzon.
2. Ditto, underside.
3. ♀, paratype [KUCGE]. Luzon.
4. Ditto, underside.

Eurema sarilata mindorana (BUTLER, 1898) [P. 16]

5. ♂. Mindoro.
6. Ditto, underside.
7. ♀, lectotype [BMNH]. Mindoro.
8. Ditto, underside.



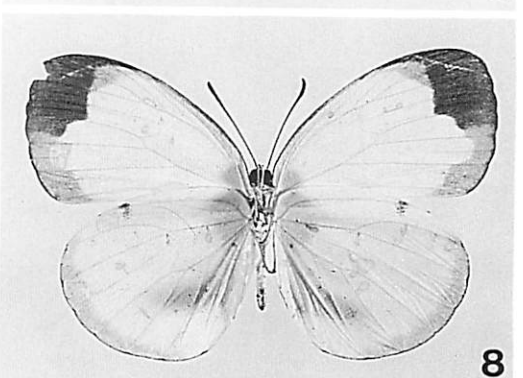
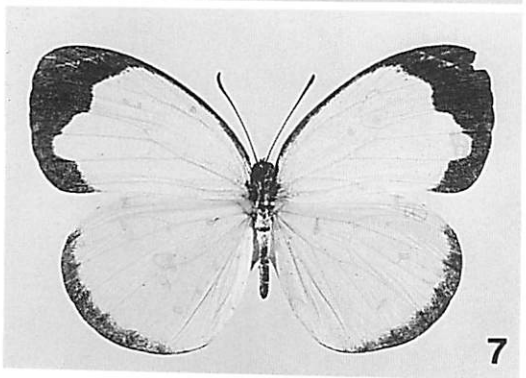
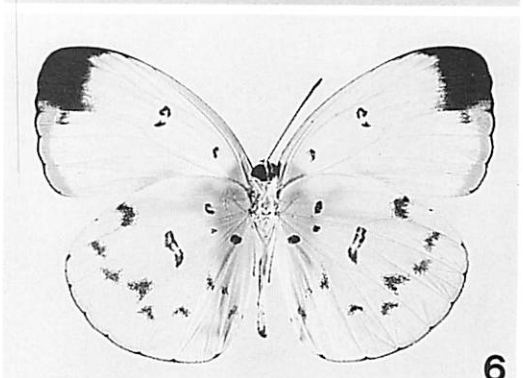
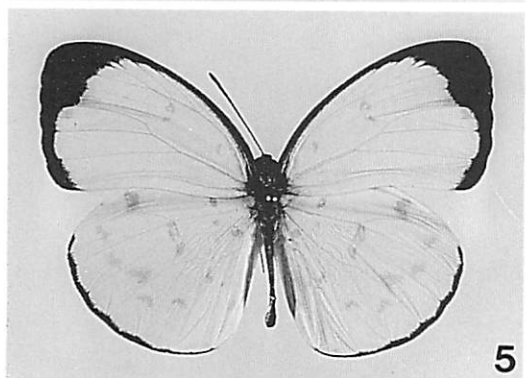
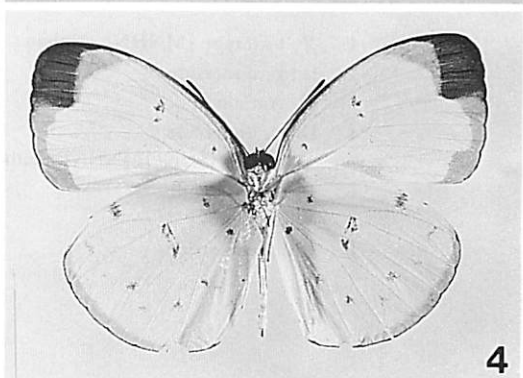
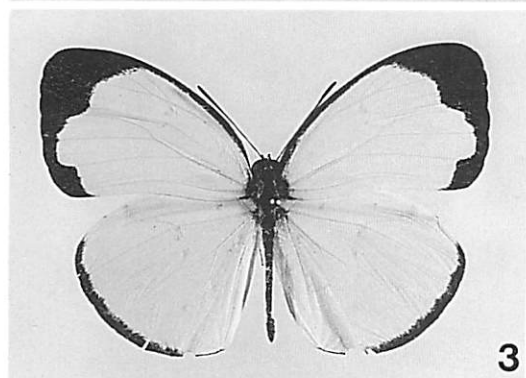
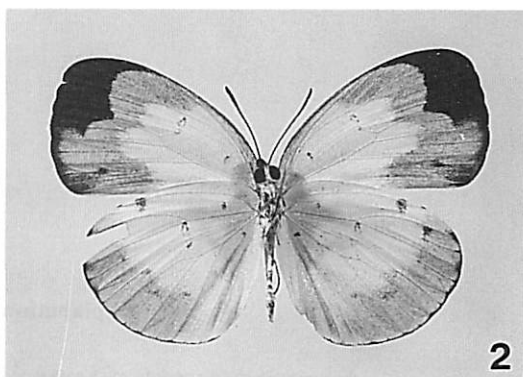
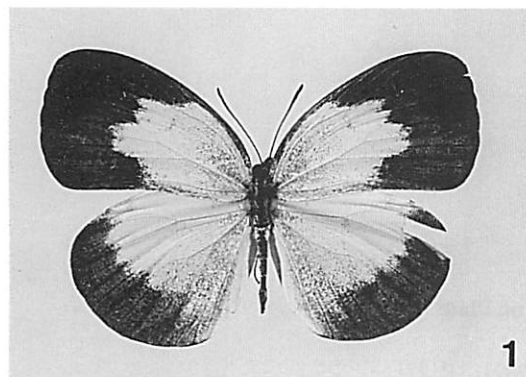
Explanation of Plate 7

Eurema sarilata mindorana (BUTLER, 1898) [P. 16]

1. ♂. Mindoro.
2. Ditto, underside.

Eurema sarilata sibuyanensis YATA & TREADAWAY, 1982 [P. 16]

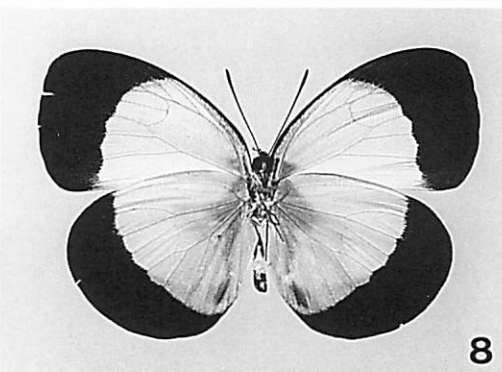
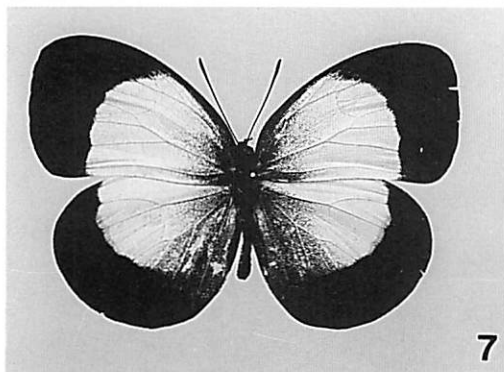
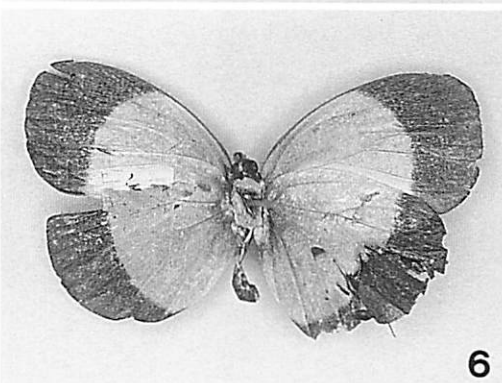
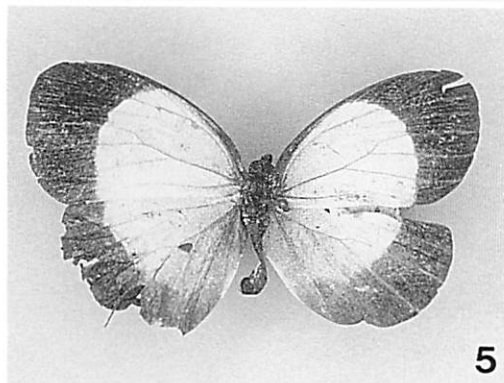
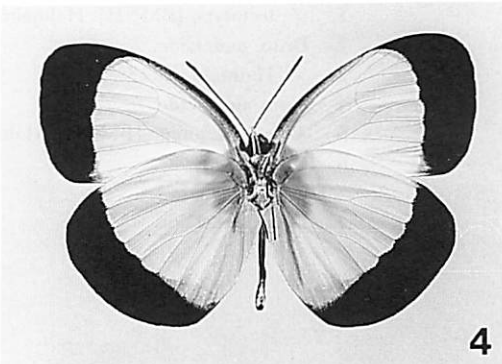
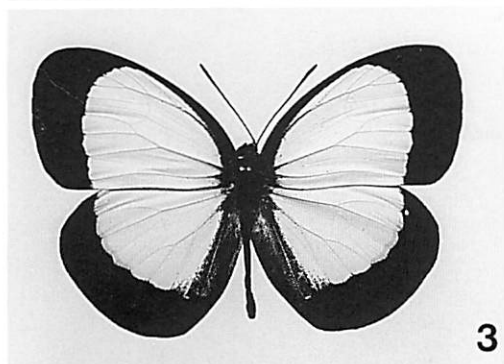
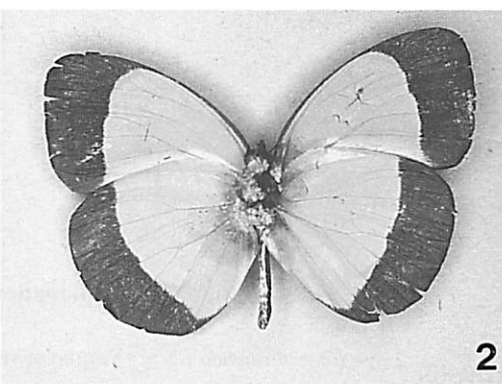
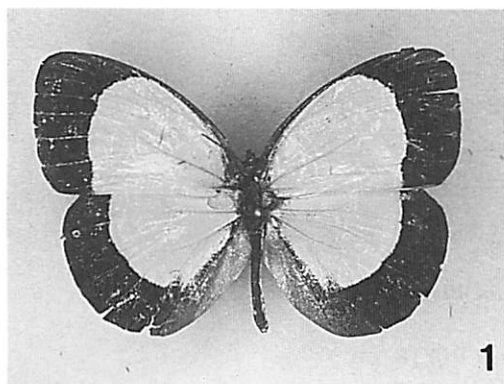
3. ♂, holotype [TREADAWAY Coll.]. Sibuyan Is.
4. Ditto, underside.
5. ♂, paratype [KUCGE]. Sibuyan Is.
6. Ditto, underside.
7. ♀. Sibuyan Is. [KUCGE]
8. Ditto, underside.



Explanation of Plate 8

Eurema candida candida (CRAMER, [1782]) [P. 22]

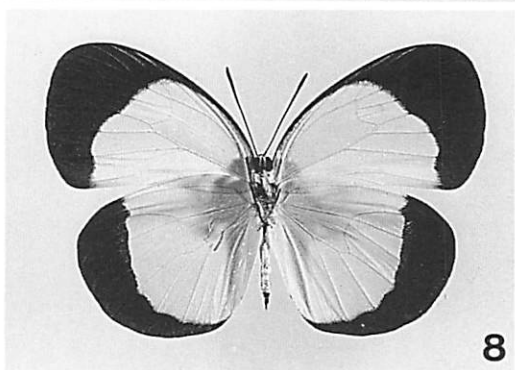
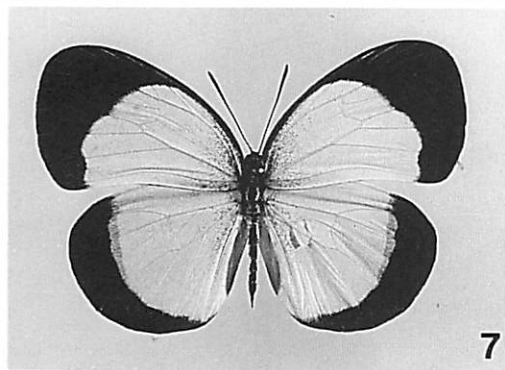
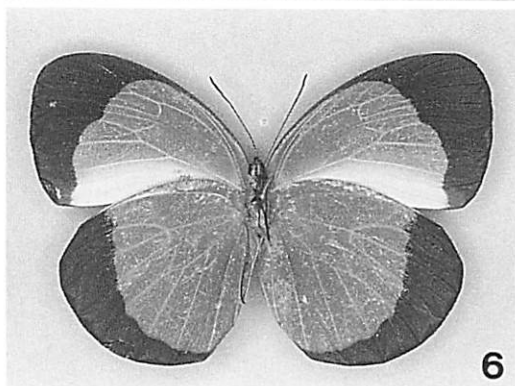
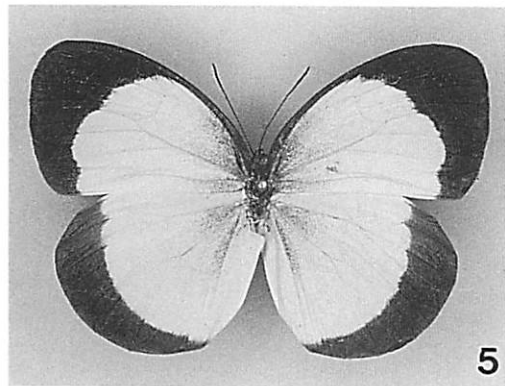
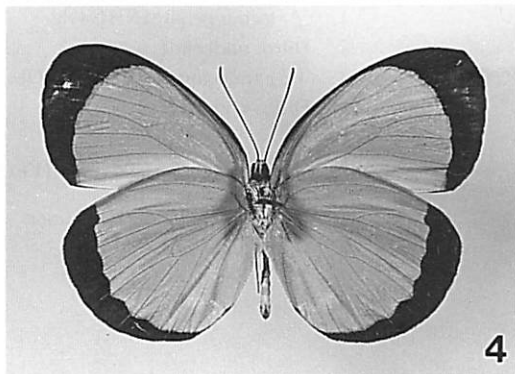
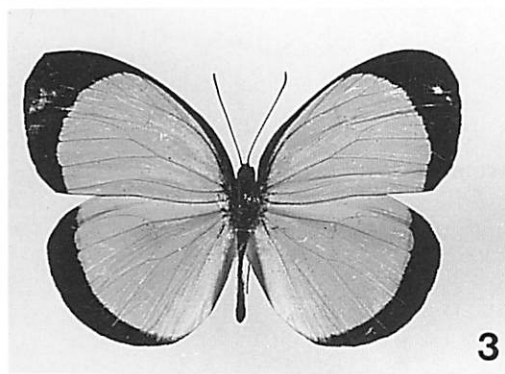
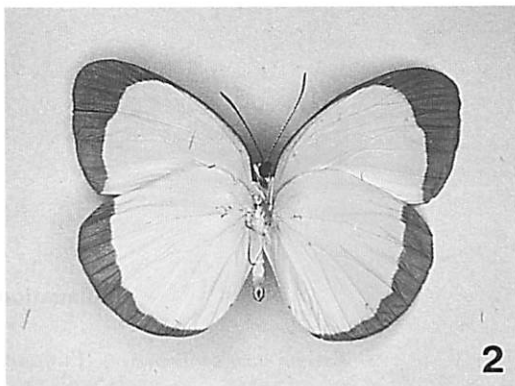
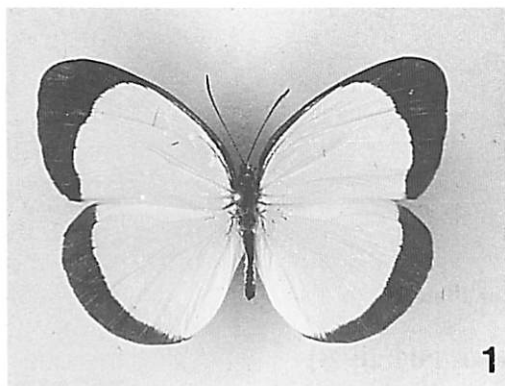
1. ♂, lectotype [MNHN]. Ambon.
2. Ditto, underside.
3. ♂. Ambon.
4. Ditto, underside.
5. ♀, paralectotype [MNHN]. Ambon.
6. Ditto, underside.
7. ♀. Ambon.
8. Ditto, underside.



Explanation of Plate 9

Eurema candida libera (FRUHSTORFER, 1910) [P. 23]

1. ♂, lectotype [BMNH]. Halmahera.
2. Ditto, underside.
3. ♂. Halmahera.
4. Ditto, underside.
5. ♀, paralectotype [BMNH]. Halmahera.
6. Ditto, underside.
7. ♀. Halmahera.
8. Ditto, underside.



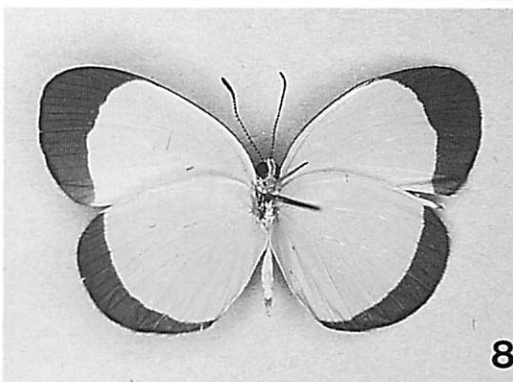
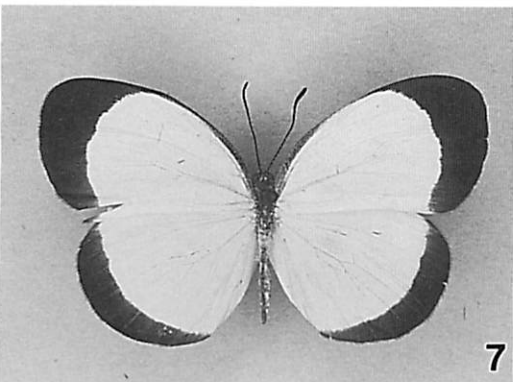
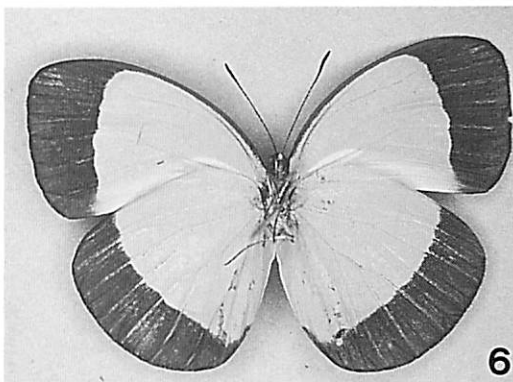
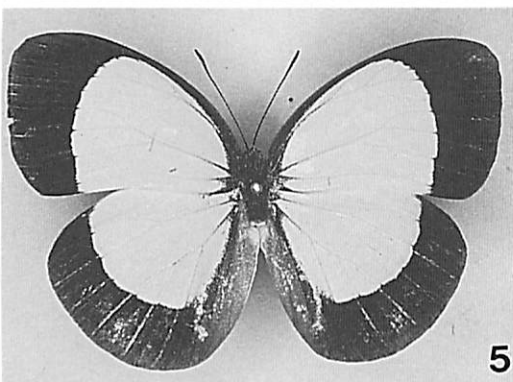
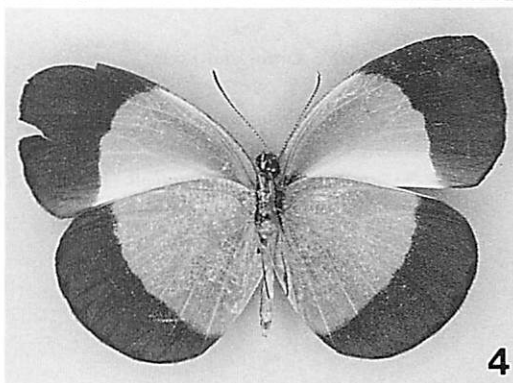
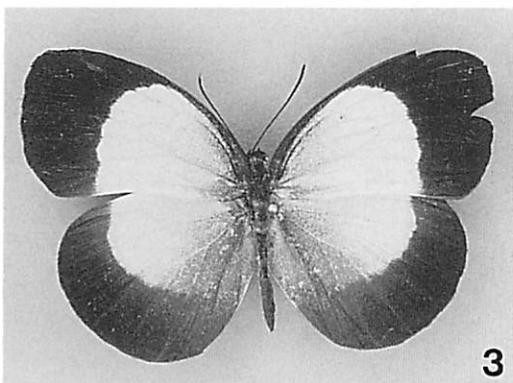
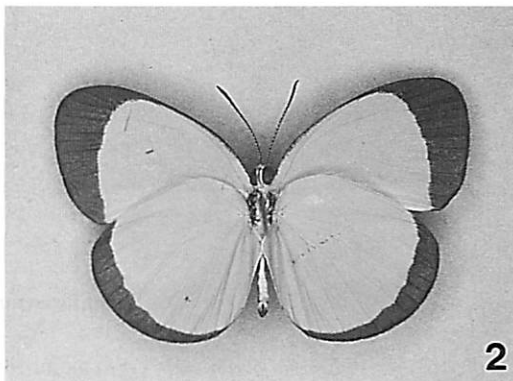
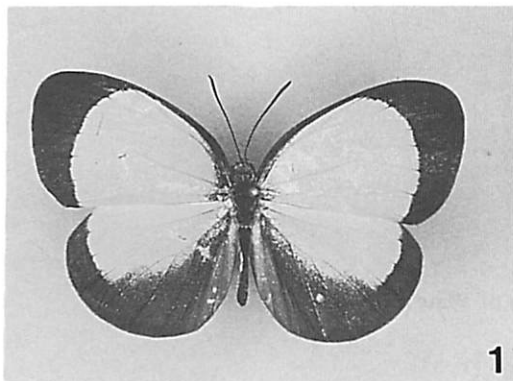
Explanation of Plate 10

Eurema candida dindymene (FRUHSTORFER, 1910) [P. 24]

1. ♂, lectotype [BMNH]. Obi.
2. Ditto, underside.
3. ♀, paralectotype [BMNH]. Obi.
4. Ditto, underside.

Eurema candida micromalayana (FRUHSTORFER, 1910) [P. 25]

5. ♂, lectotype [BMNH]. Timor.
6. Ditto, underside.
7. ♀. Timor.
8. Ditto, underside.



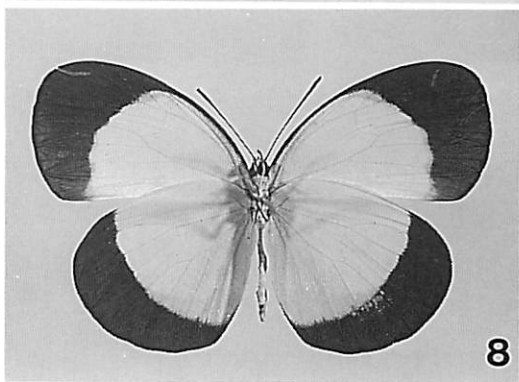
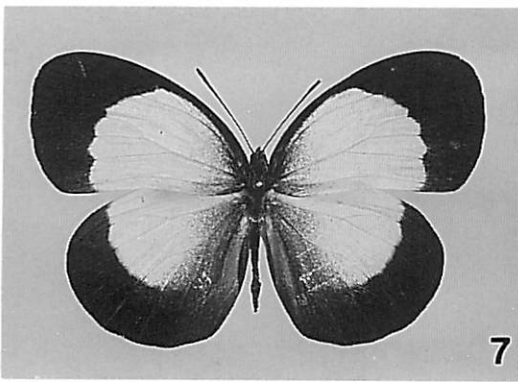
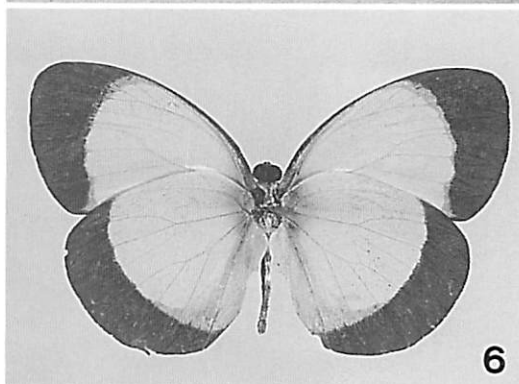
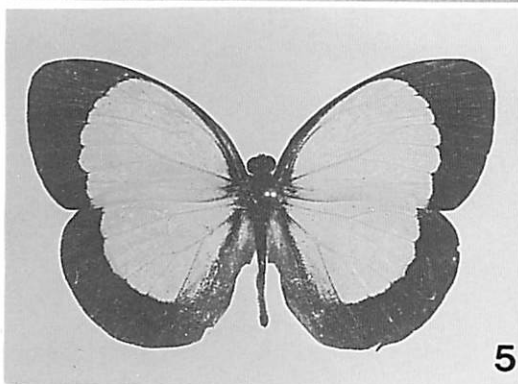
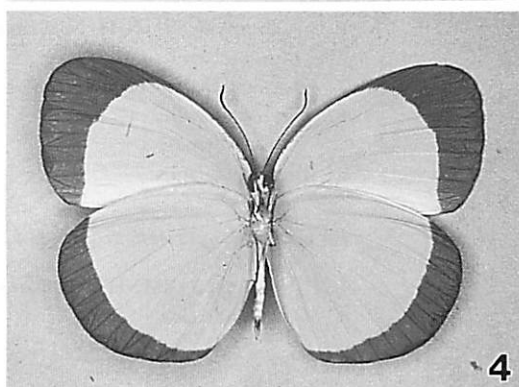
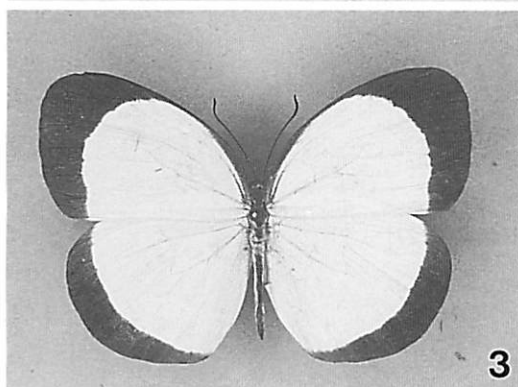
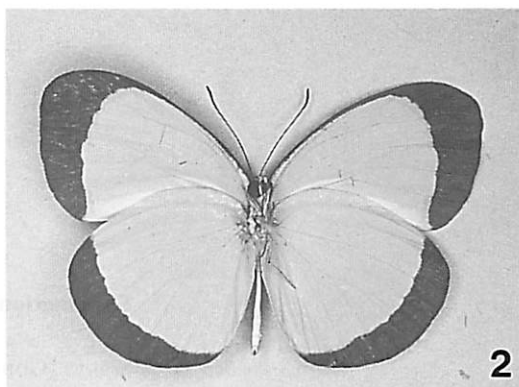
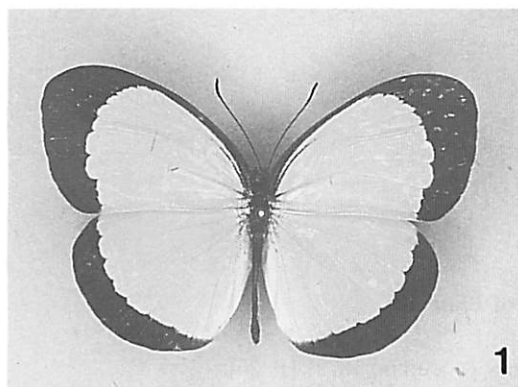
Explanation of Plate 11

Eurema puella virgo (WALLACE, 1867) [P. 33]

1. ♂. Aru.
2. Ditto, underside.
3. ♀. Aru.
4. Ditto, underside.

Eurema candida talboti (HULSTAERT, 1923) [P. 25]

5. ♂. Key.
6. Ditto, underside.
7. ♀. Key.
8. Ditto, underside.



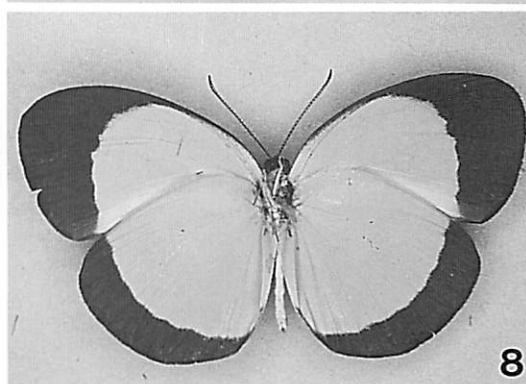
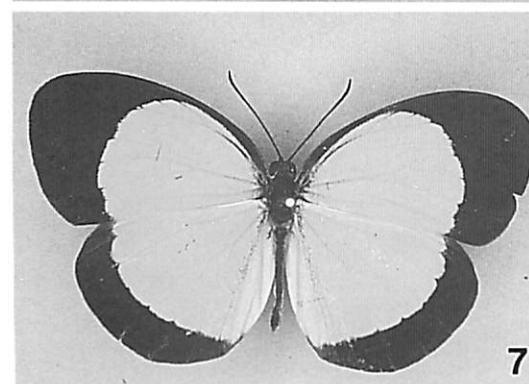
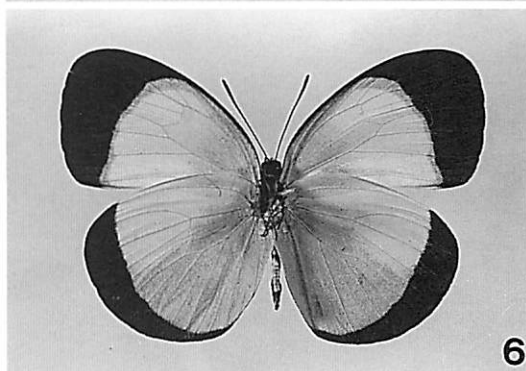
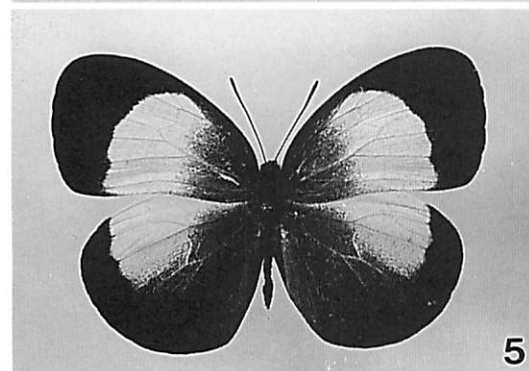
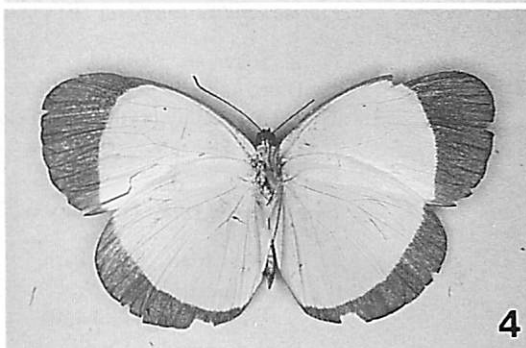
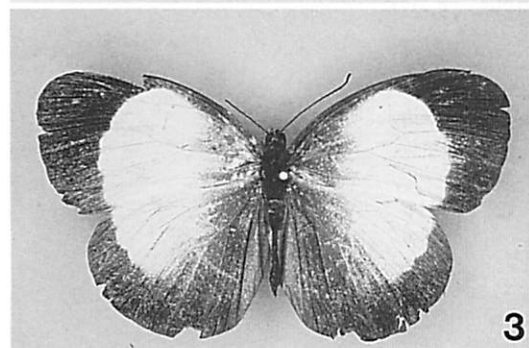
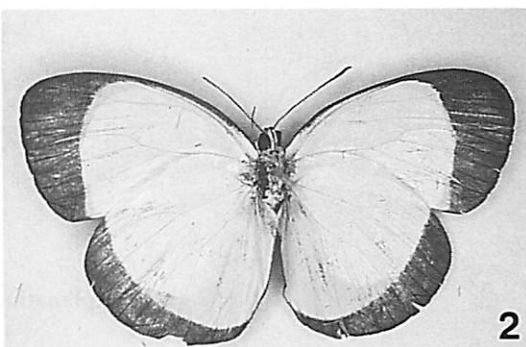
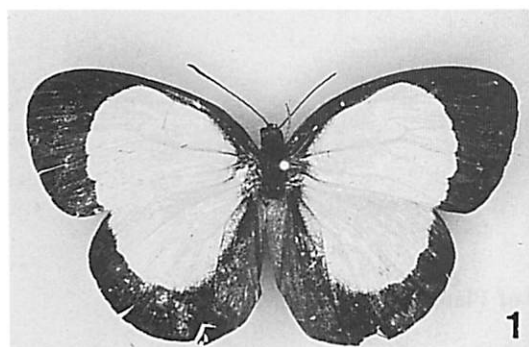
Explanation of Plate 12

Eurema candida xanthomelaena (GODMAN & SALVIN, 1879) [P. 26]

1. ♂, lectotype [BMNH]. New Ireland.
2. Ditto, underside.
3. ♀, paralectotype [BMNH]. New Ireland.
4. Ditto, underside.
5. ♀, New Britain.
6. Ditto, underside.

Eurema candida woodfordi (BUTLER, 1898) [P. 27]

7. ♂, lectotype [BMNH]. Solomons, Guadalcanal.
8. Ditto, underside.



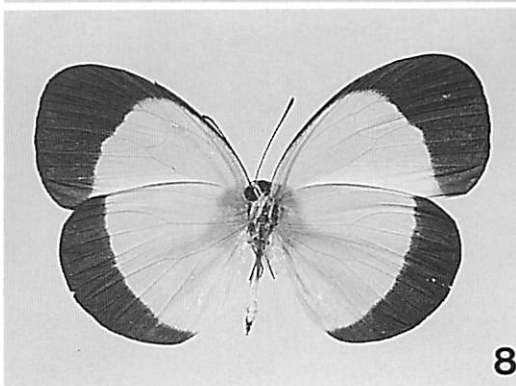
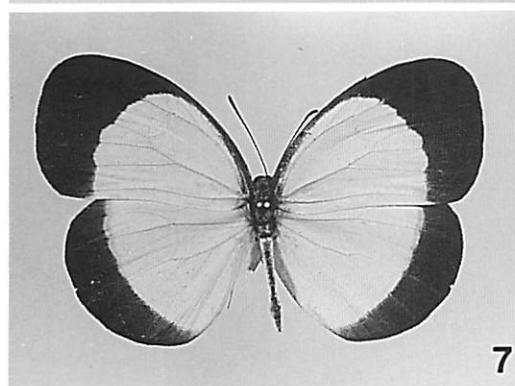
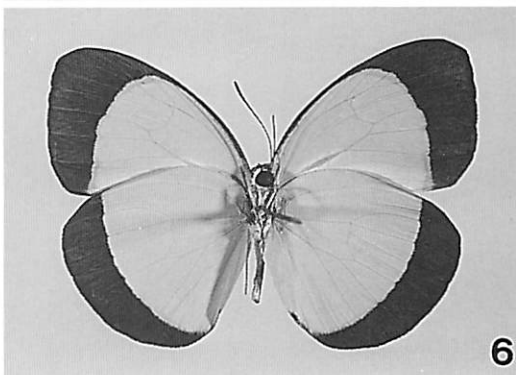
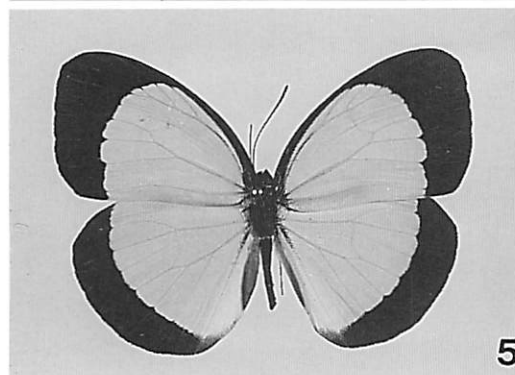
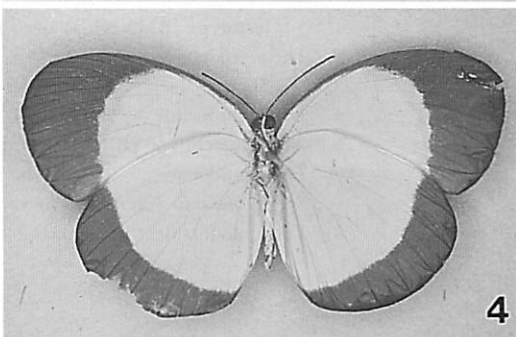
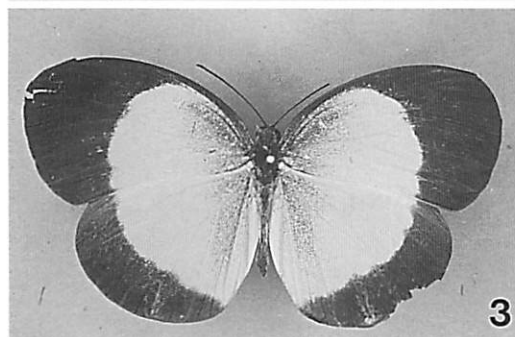
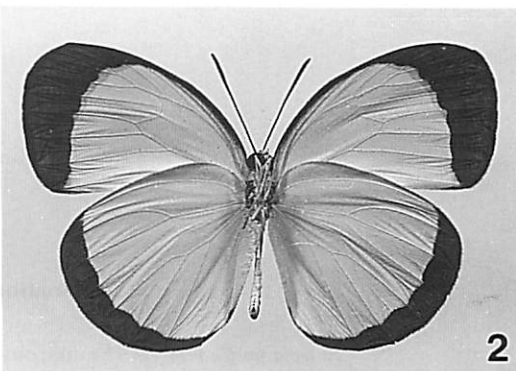
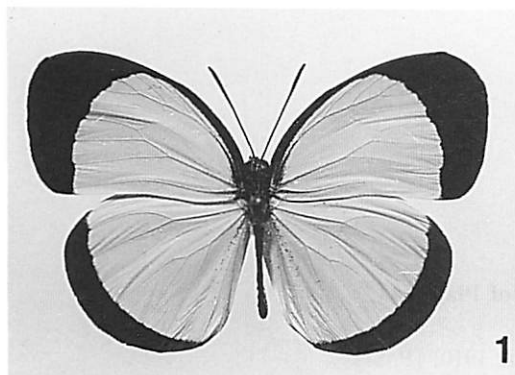
Explanation of Plate 13

Eurema candida woodfordi (BUTLER, 1898) [P. 27]

1. ♂. Solomons, Ysabel.
2. Ditto, underside.
3. ♀, paralectotype [BMNH]. Solomons, Guadalcanal.
4. Ditto, underside.

Eurema puella puella (BOISDUVAL, 1832) [P. 31]

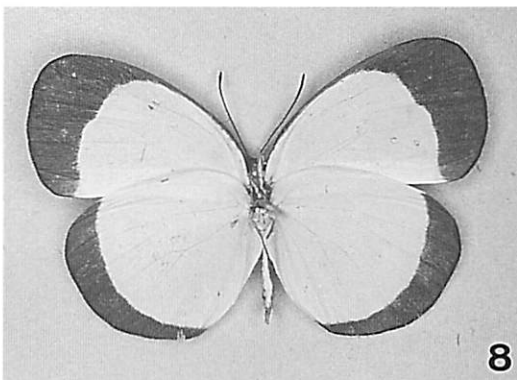
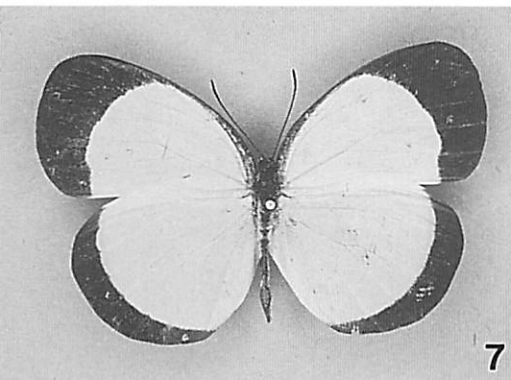
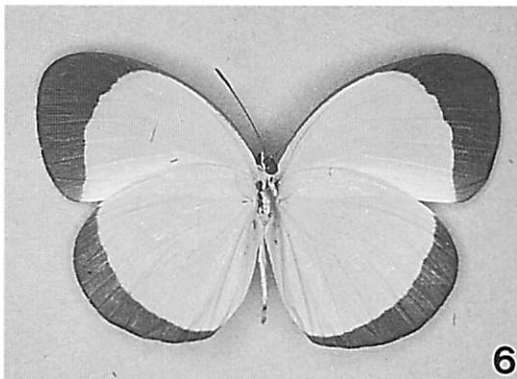
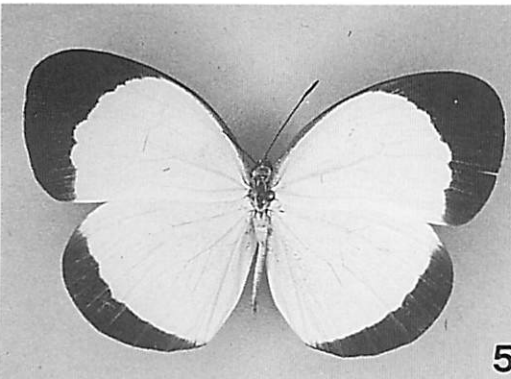
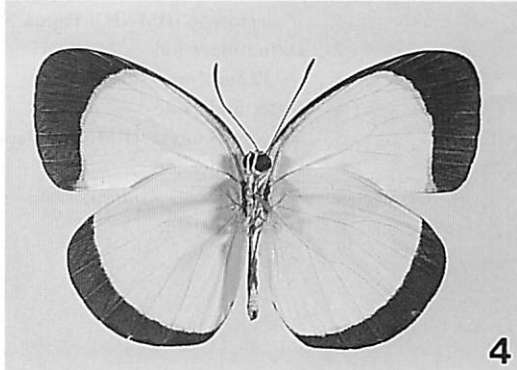
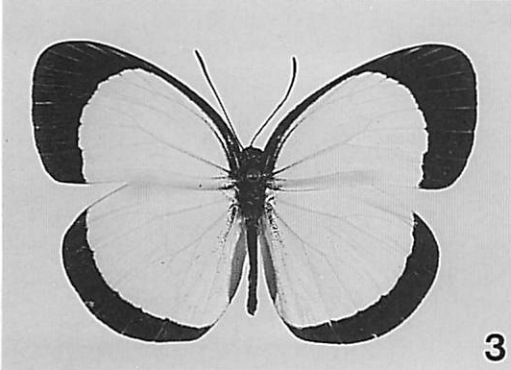
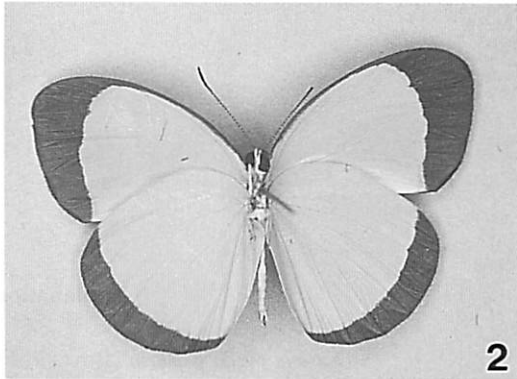
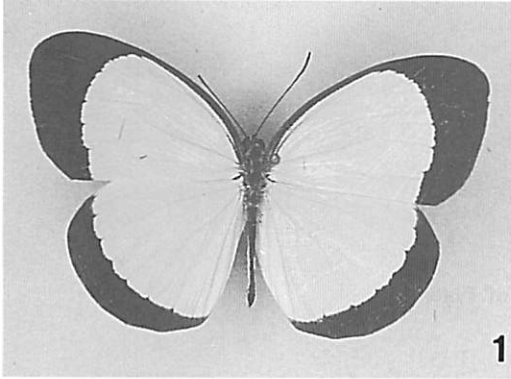
5. ♂. West Irian, Manokwari.
6. Ditto, underside.
7. ♀. West Irian, Manokwari.
8. Ditto, underside.



Explanation of Plate 14

Eurema puella octogesa (FRUHSTORFER, 1910) [P. 31]

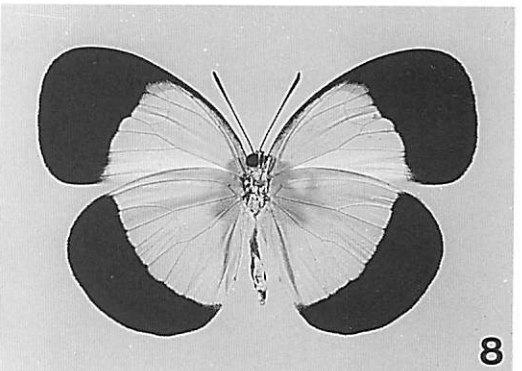
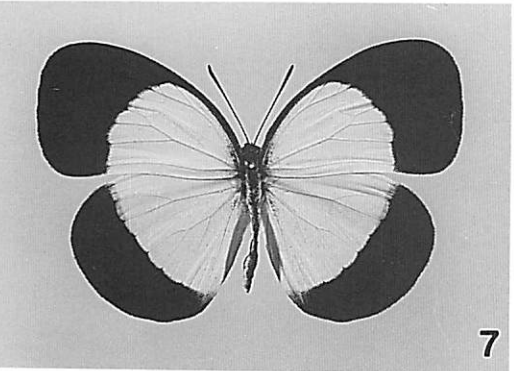
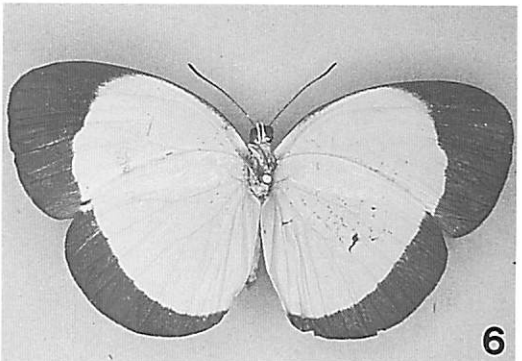
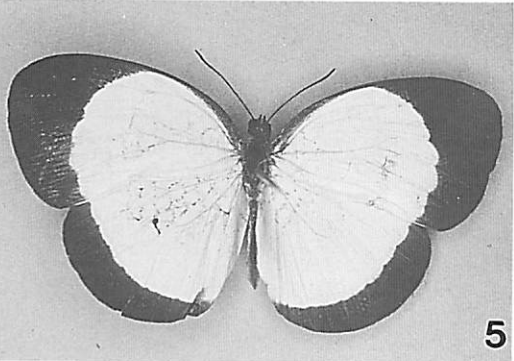
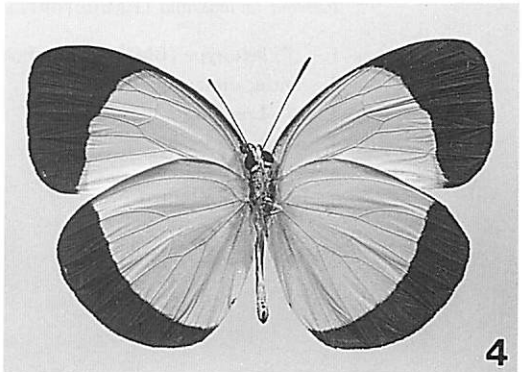
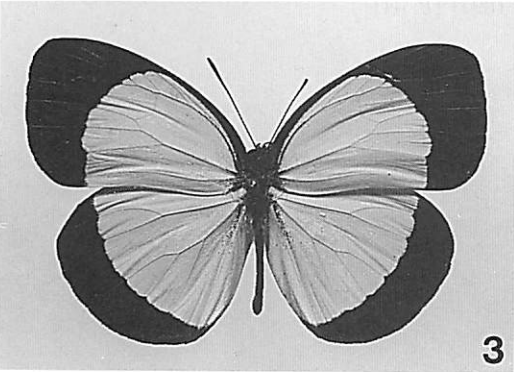
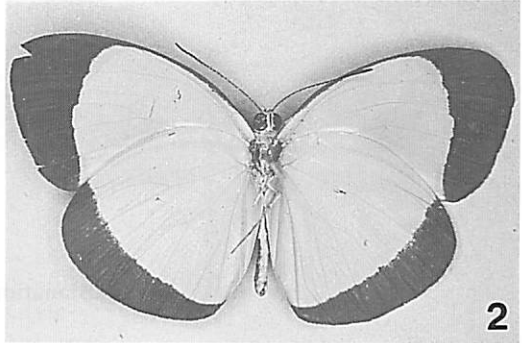
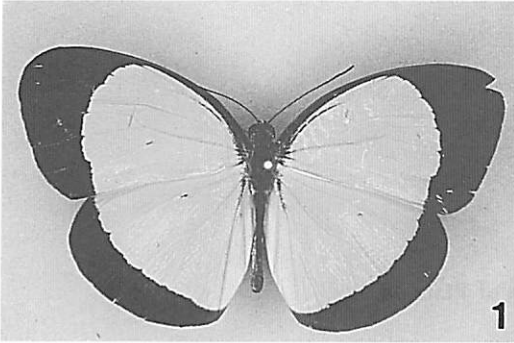
1. ♂, lectotype [BMNH]. Waigeo Is.
2. Ditto, underside.
3. ♂. Shouten Is.
4. Ditto, underside.
5. ♀, paralectotype [BMNH]. Waigeo Is.
6. Ditto, underside.
7. ♀, (f. *biakensis* JOICEY & TALBOT, lectotype [BMNH]. Biak Is.
8. Ditto, underside.



Explanation of Plate 15

Eurema puella papuana (BUTLER, 1898) [P. 33]

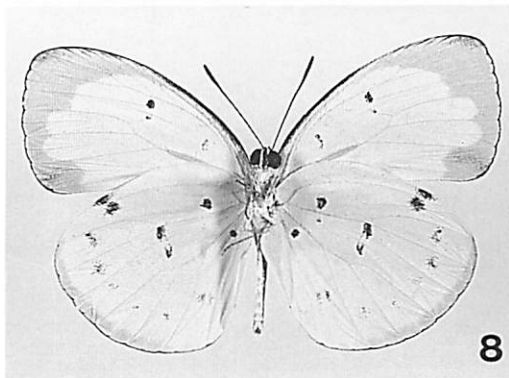
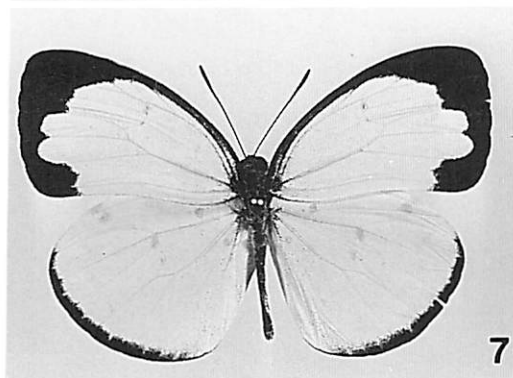
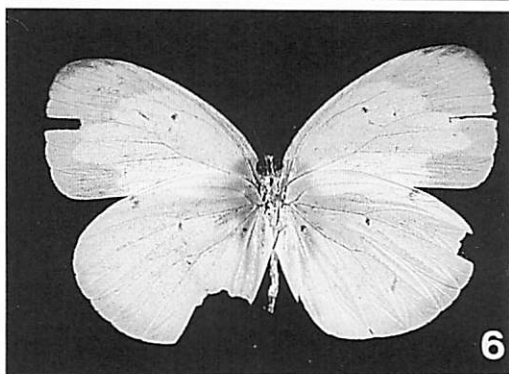
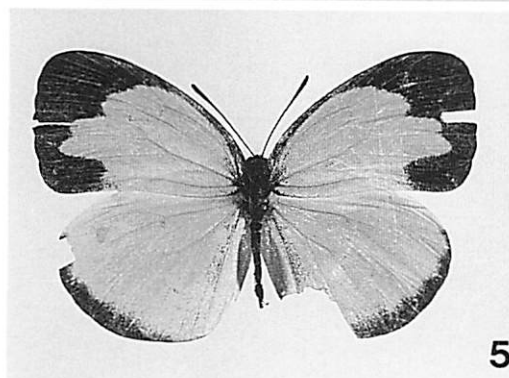
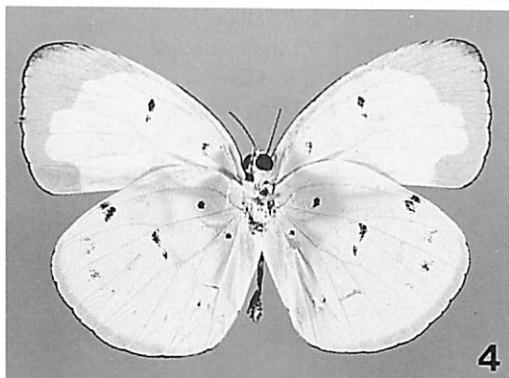
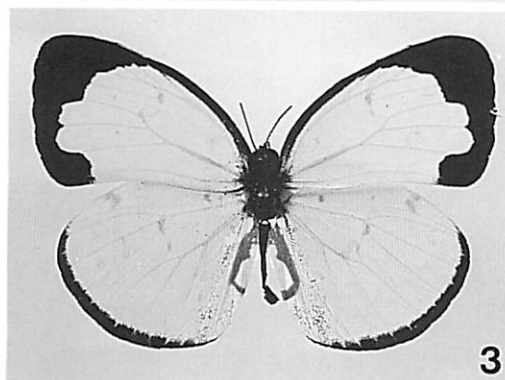
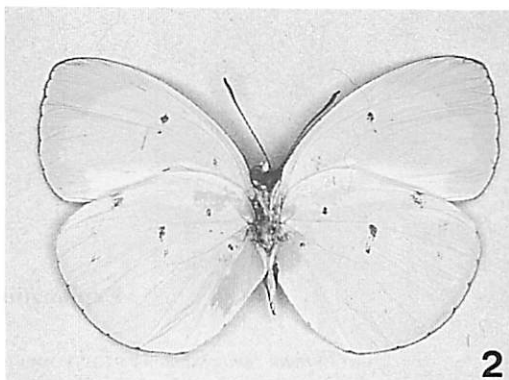
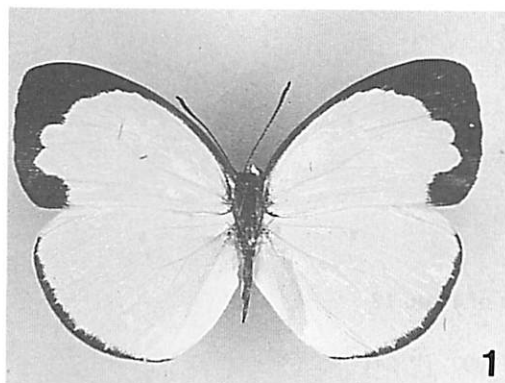
1. ♂, lectotype [BMNH]. Papua New Guinea.
2. Ditto, underside.
3. ♂. Papua New Guinea, Wau.
4. Ditto, underside.
5. ♀, paralectotype [BMNH]. Papua New Guinea.
6. Ditto, underside.
7. ♀. Papua New Guinea, Wau.
8. Ditto, underside.



Explanation of Plate 16

Eurema lombokiana (FRUHSTORFER, 1897) [P. 34]

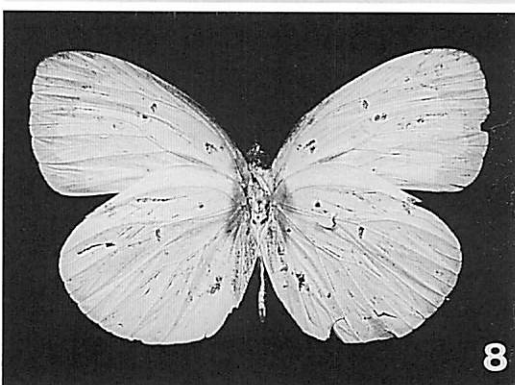
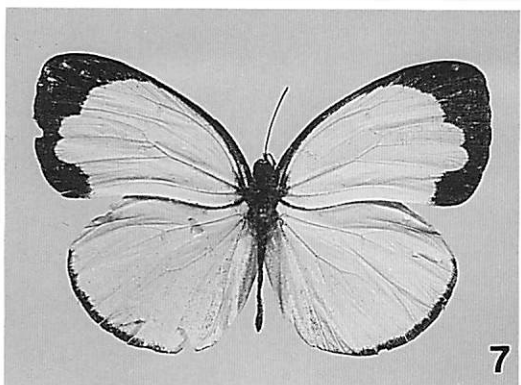
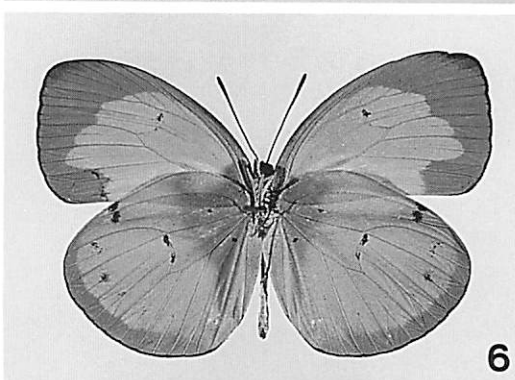
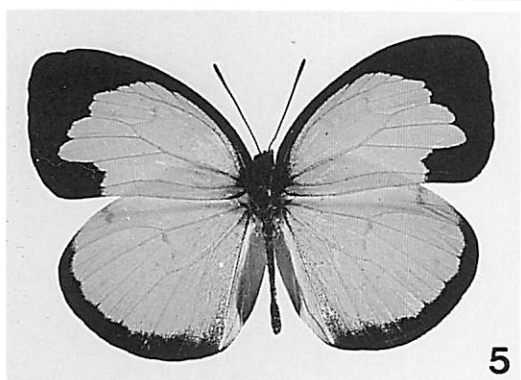
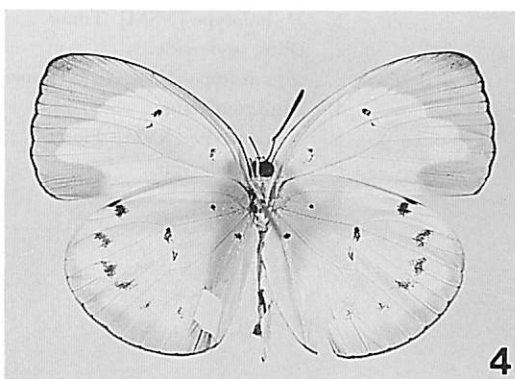
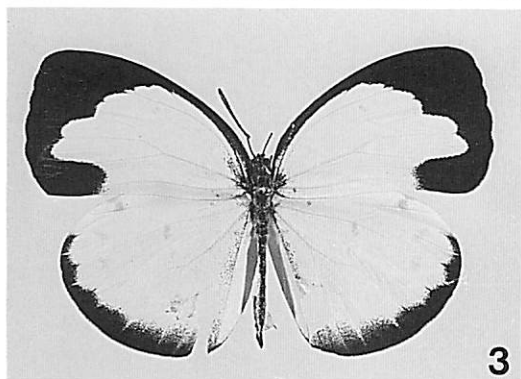
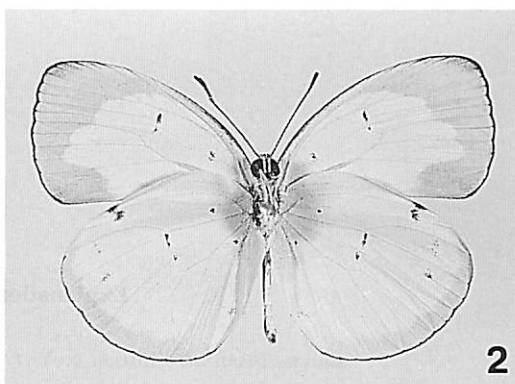
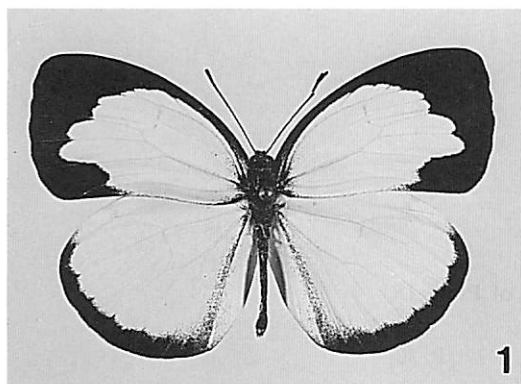
1. ♂, lectotype [BMNH]. Lombok.
2. Ditto, underside.
3. ♂. Lombok.
4. Ditto, underside.
5. ♀. Lombok.
6. Ditto, underside.
7. ♂. Sumba.
8. Ditto, underside.



Explanation of Plate 17

Eurema lumbokiana (FRUHSTORFER, 1897) [P. 34]

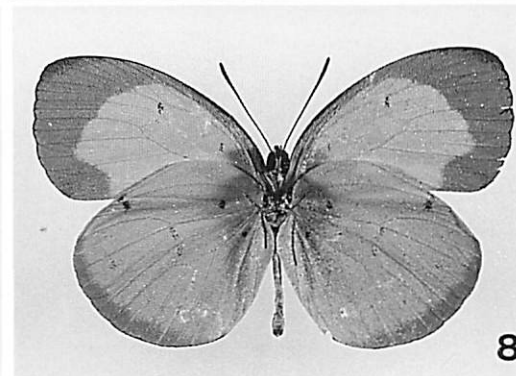
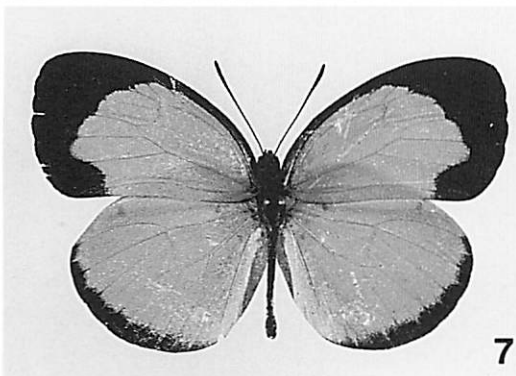
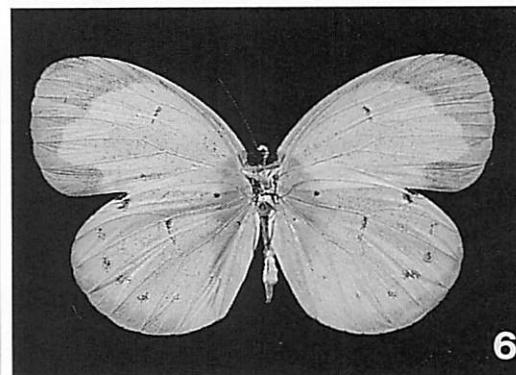
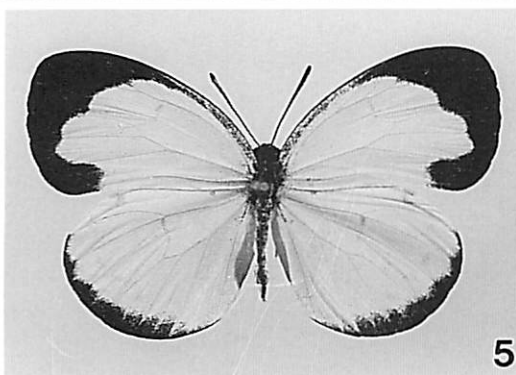
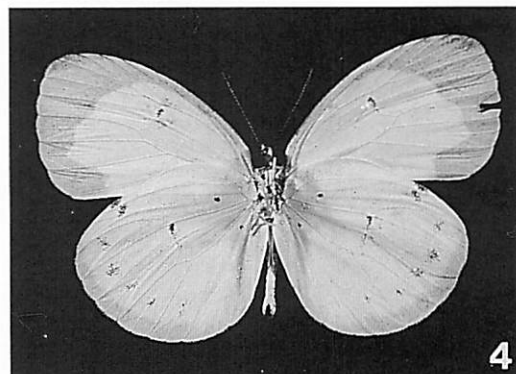
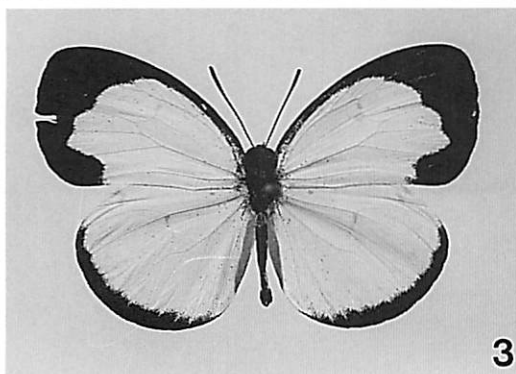
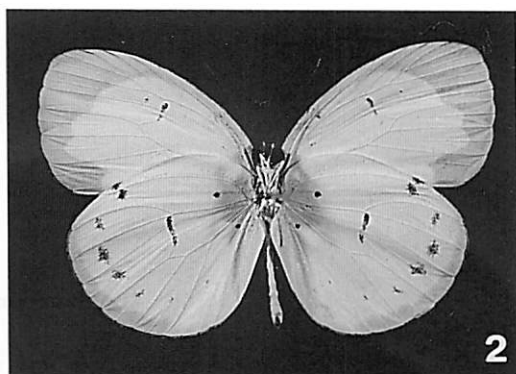
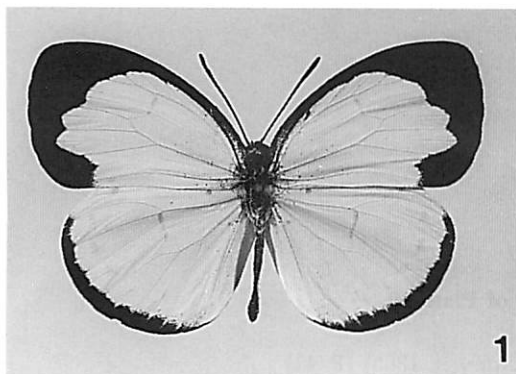
1. ♂. Flores.
2. Ditto, underside.
3. ♀. Flores.
4. Ditto, underside.
5. ♂. Adonara.
6. Ditto, underside.
7. ♂. Timor.
8. Ditto, underside.



Explanation of Plate 18

Eurema timorensis Shirôzu & YATA, 1977 [P. 38]

1. ♂, holotype [NSM]. Timor.
2. Ditto, underside.
3. ♂, paratype [KUCGE]. Timor.
4. Ditto, underside.
5. ♀, paratype [NSM]. Flores.
6. Ditto, underside.
7. ♀. Adonara.
8. Ditto, underside.



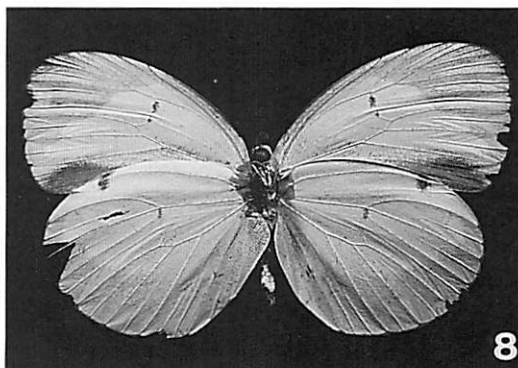
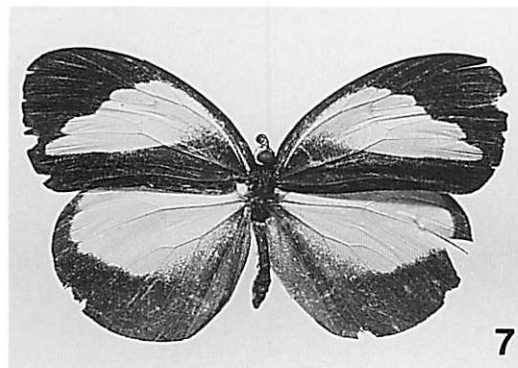
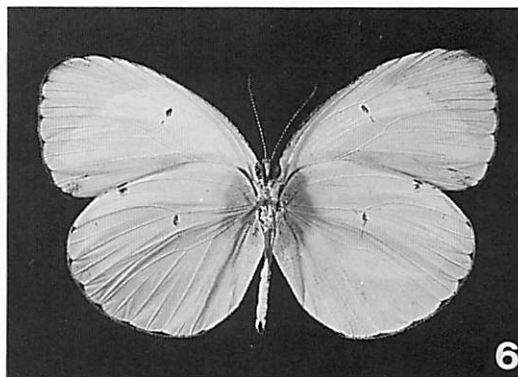
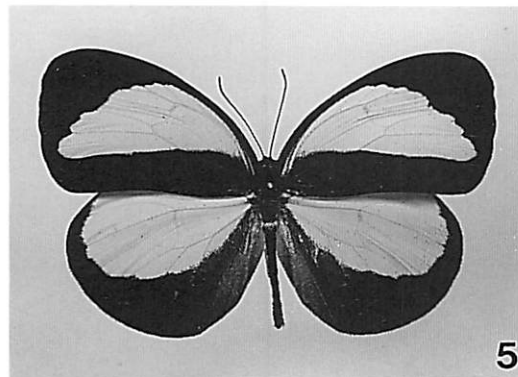
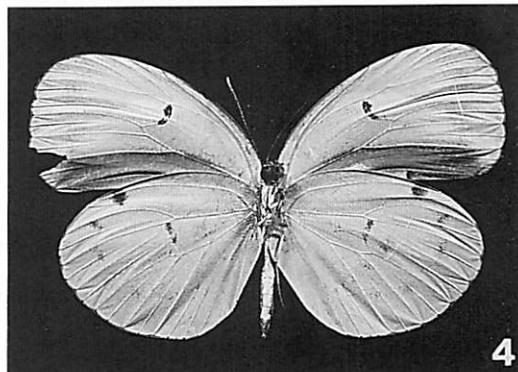
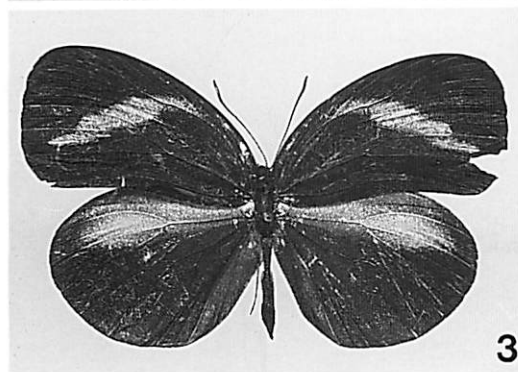
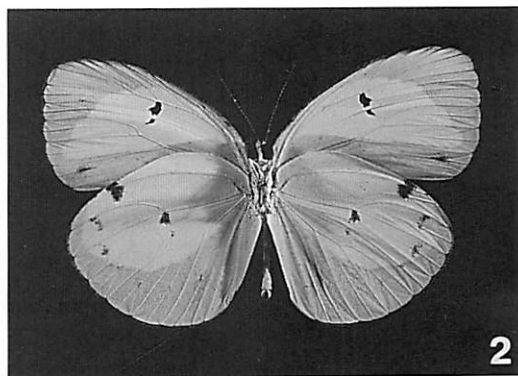
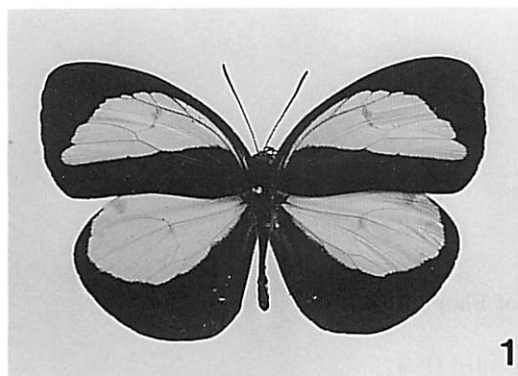
Explanation of Plate 19

Eurema tominia tominia (VAN VOLLENHOVEN, 1865) [P. 45]

1. ♂. Sulawesi.
2. Ditto, underside.
3. ♀. Sulawesi.
4. Ditto, underside.

Eurema tominia nabalua CORBET & PENDLEBURY, 1932 [P. 46]

5. ♂. N. Borneo.
6. Ditto, underside.
7. ♀. N. Borneo.
8. Ditto, underside.



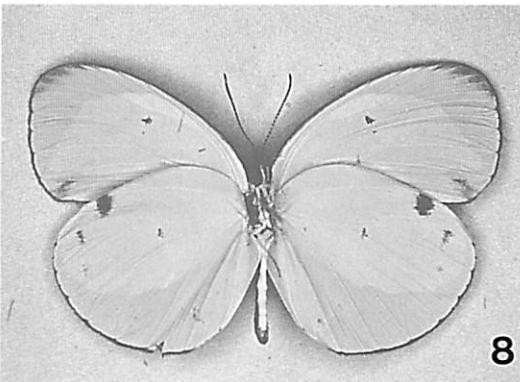
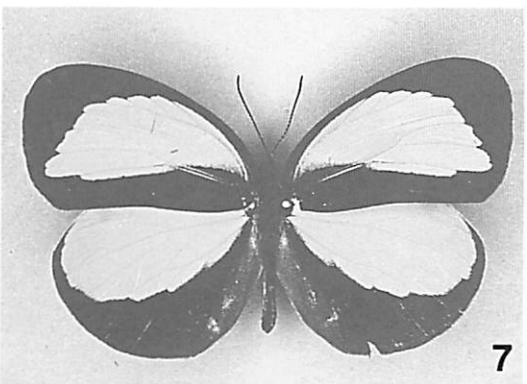
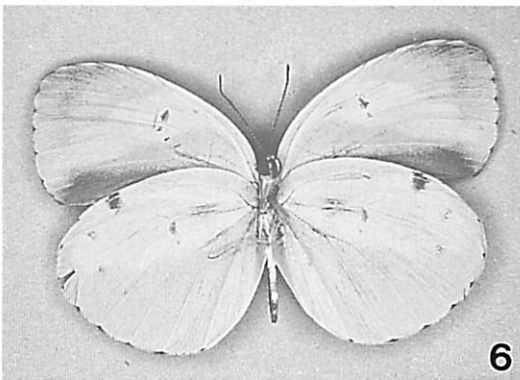
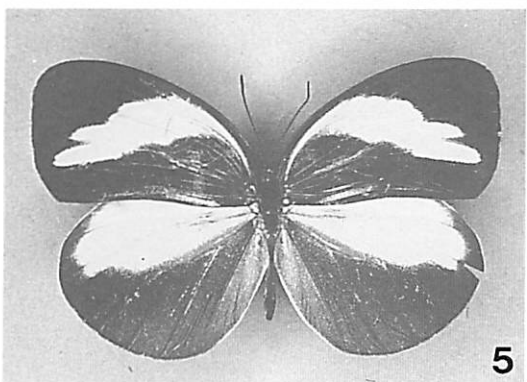
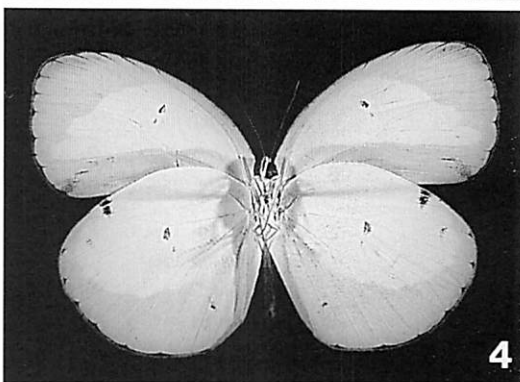
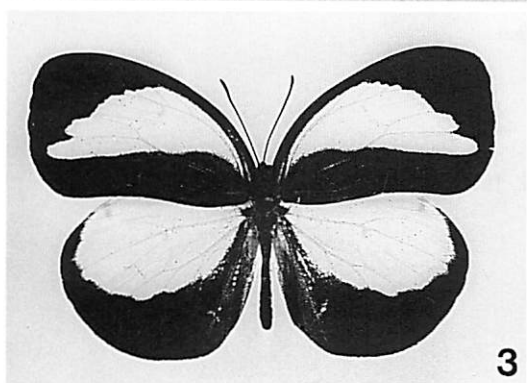
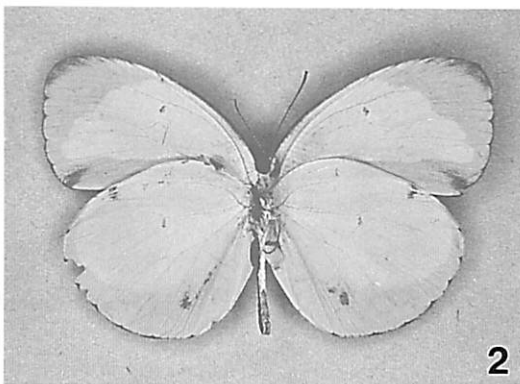
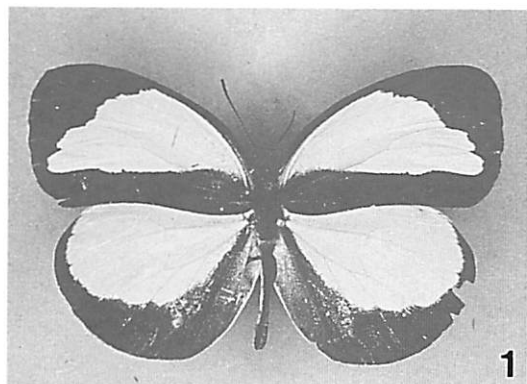
Explanation of Plate 20

Eurema tominia horatia FRUHSTORFER, 1910 [P. 47]

1. ♂, lectotype [BMNH]. S. Borneo.
2. Ditto, underside.
3. ♂. S. Borneo.
4. Ditto, underside.
5. ♀. S. Borneo.
6. Ditto, underside.

Eurema tominia mangolina FRUHSTORFER, 1910 [P. 48]

7. ♂, lectotype [BMNH]. Banggai.
8. Ditto, underside.



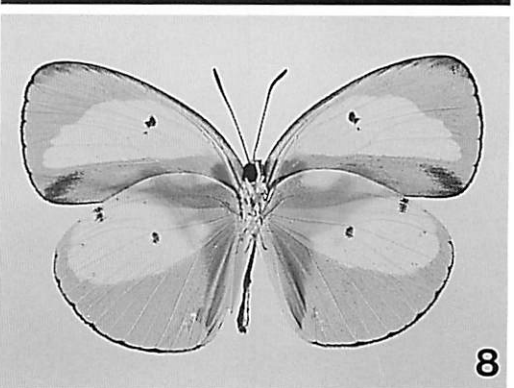
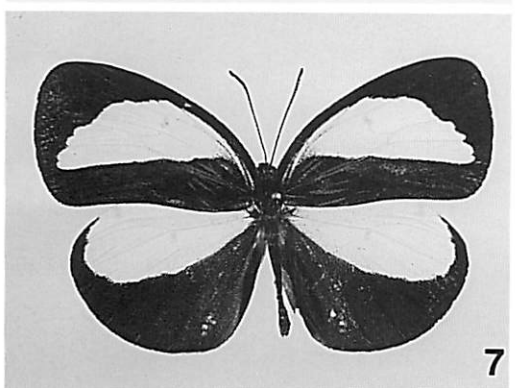
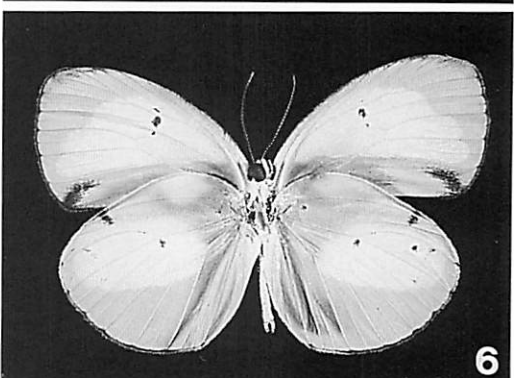
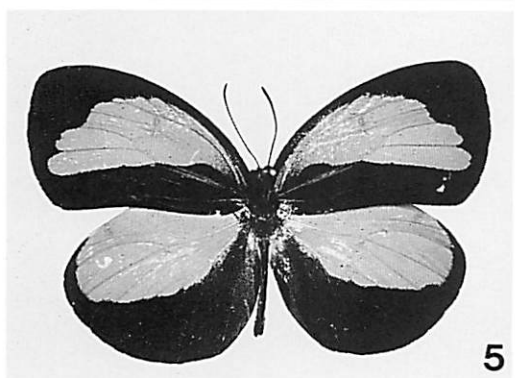
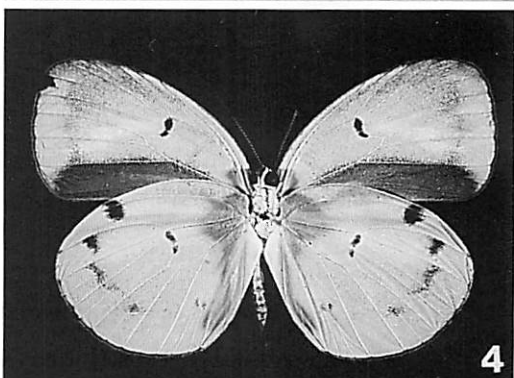
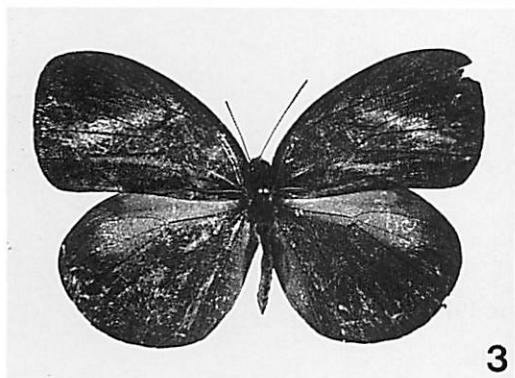
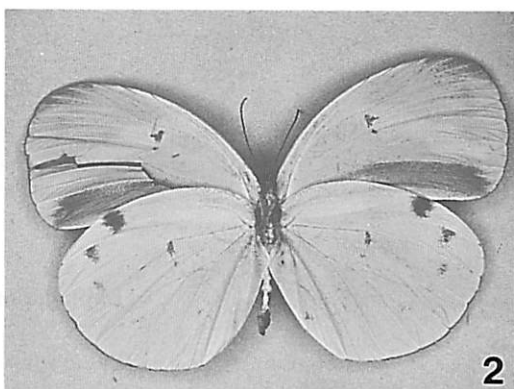
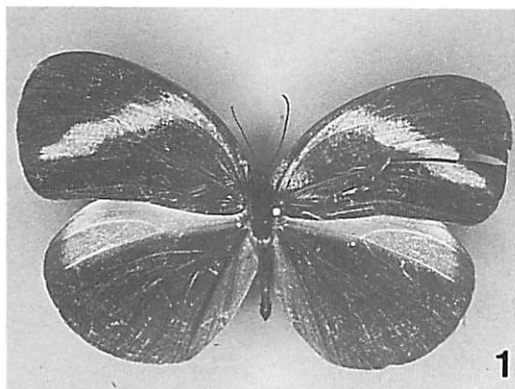
Explanation of Plate 21

Eurema tominia mangolina FRUHSTORFER, 1910 [P. 48]

1. ♀, paralectotype [BMNH]. Banggai.
2. Ditto, underside.
3. ♀. Banggai.
4. Ditto, underside.

Eurema tominia arsia (FRUHSTORFER, 1910) [P. 49]

5. ♂. Tanahdjampea.
6. Ditto, underside.
7. ♂. Kalao Is.
8. Ditto, underside.



Explanation of Plate 22

Eurema tominia arsia (FRUHSTORFER, 1910) [P. 49]

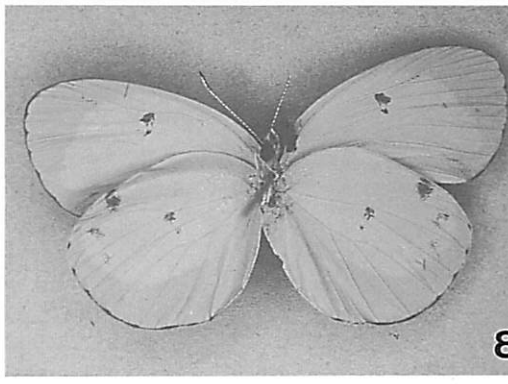
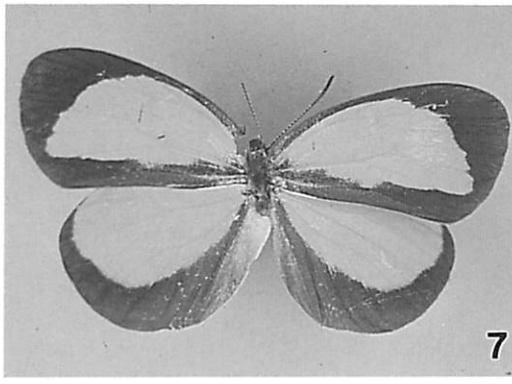
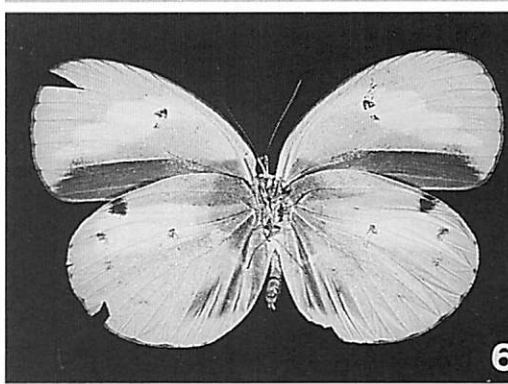
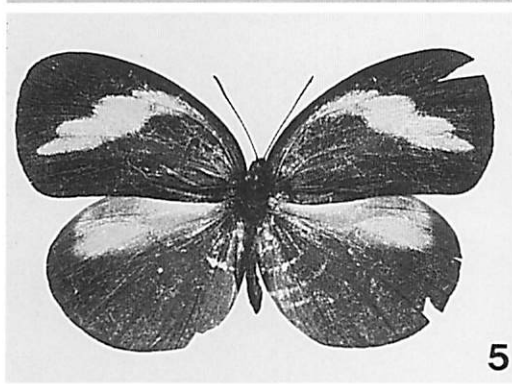
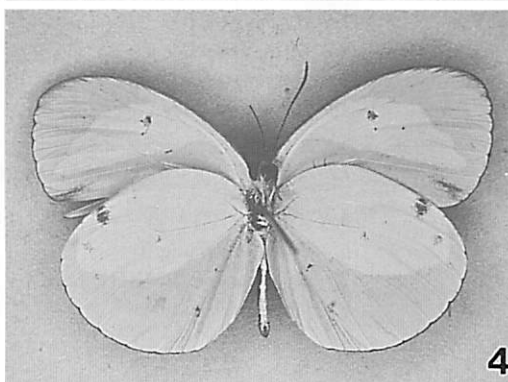
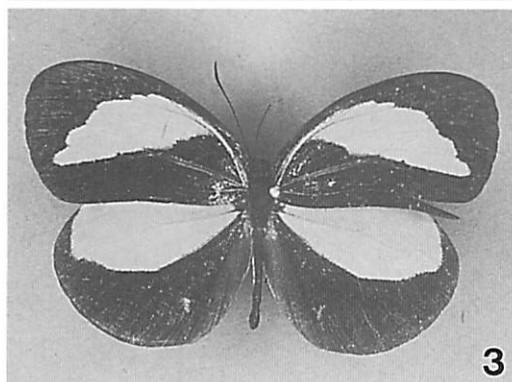
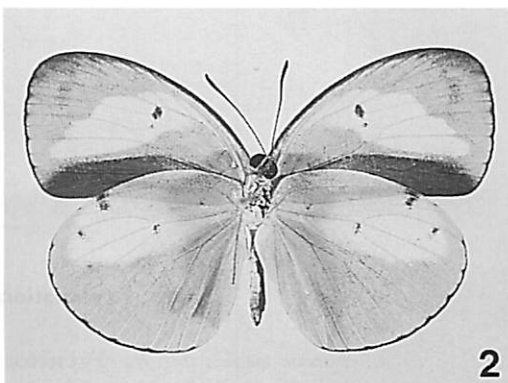
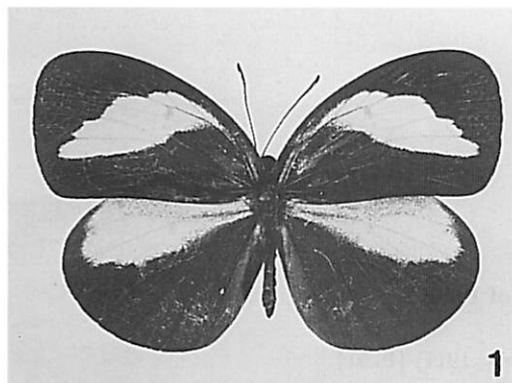
1. ♀. Kalao Is.
2. Ditto, underside.

Eurema tominia halesa FRUHSTORFER, 1910 [P. 50]

3. ♂, holotype [BMNH]. Saleyer Is.
4. Ditto, underside.
5. ♀. Saleyer Is.
6. Ditto, underside.

Eurema tominia faunia (FRUHSTORFER, 1910) [P. 50]

7. ♂, holotype [BMNH]. Tukangbesi Iss.
8. Ditto, underside.



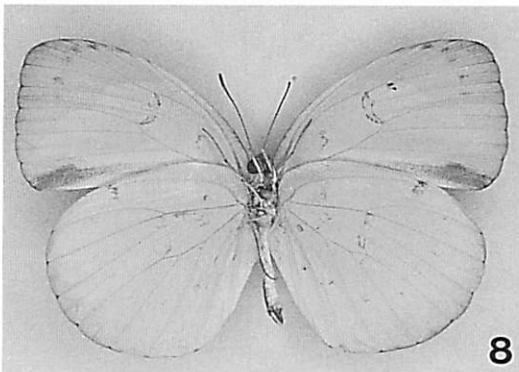
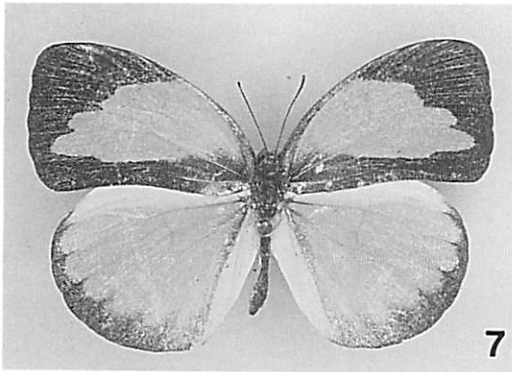
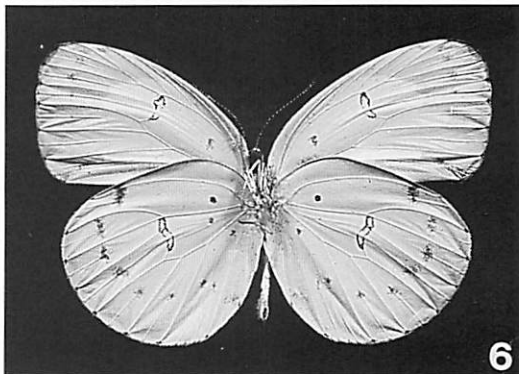
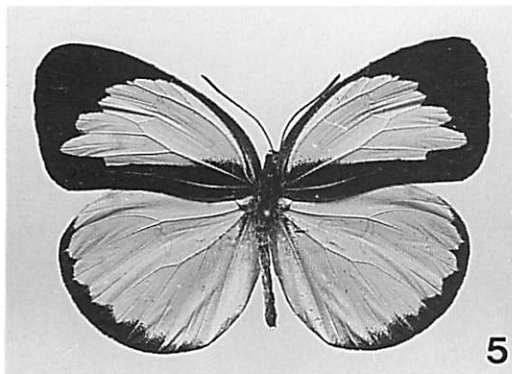
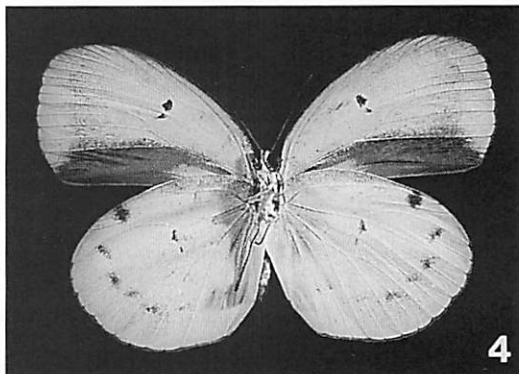
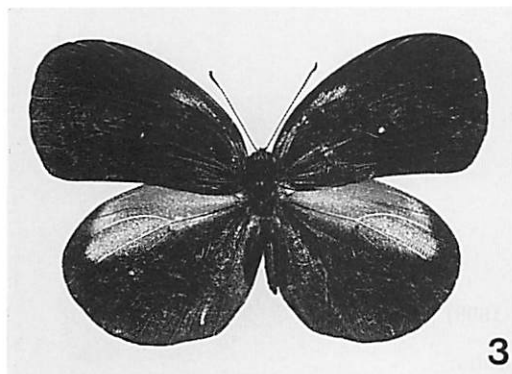
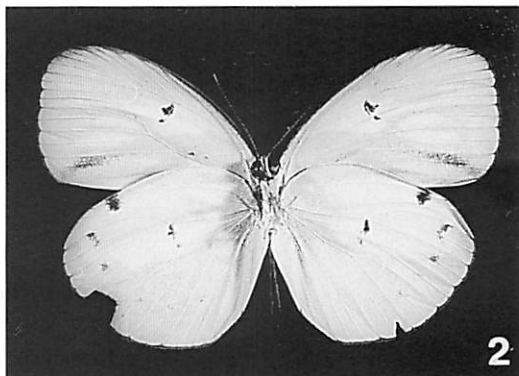
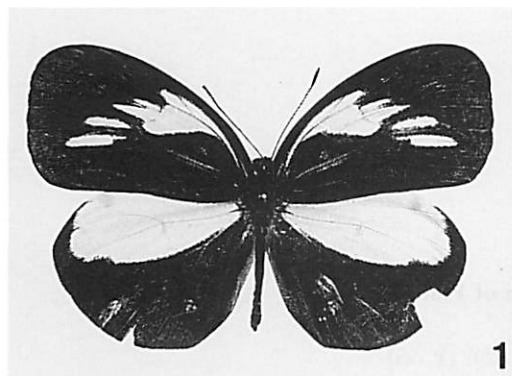
Explanation of Plate 23

Eurema tominia theristra (FRUHSTORFER, 1911) [P. 51]

1. ♂. Sangihe Is.
2. Ditto, underside.
3. ♀. Sangihe Is.
4. Ditto, underside.

Eurema tilaha tilaha (HORSFIELD, 1829) [P. 51]

5. ♂. Java.
6. Ditto, underside.
7. ♀, lectotype [BMNH]. Java.
8. Ditto, underside.



Explanation of Plate 24

Eurema tilaha tilaha (HORSFIELD, 1829) [P. 55]

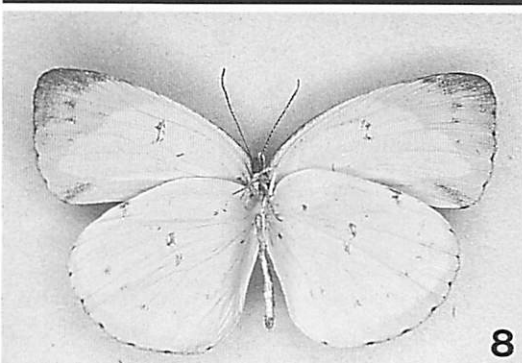
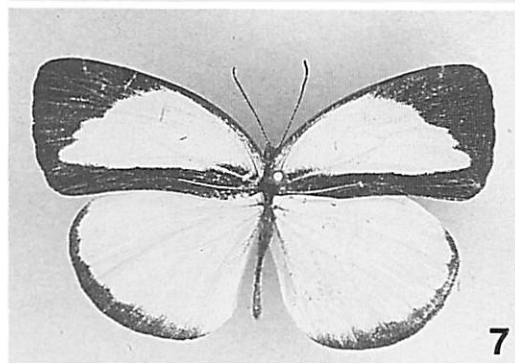
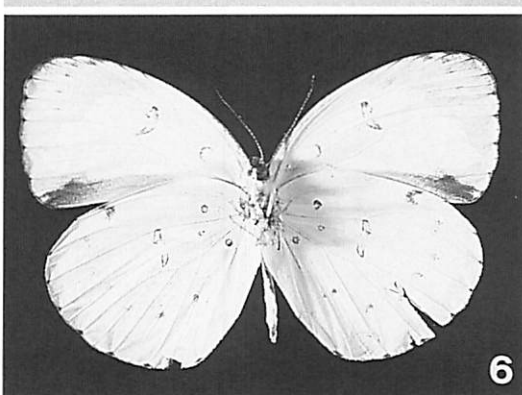
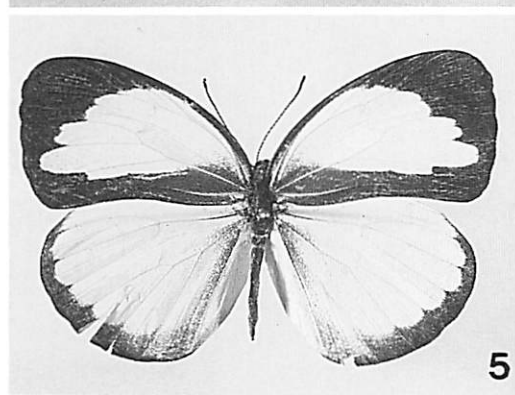
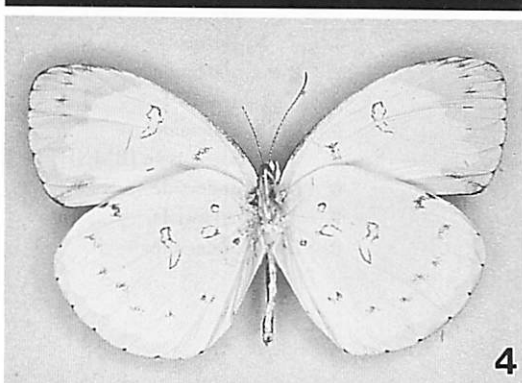
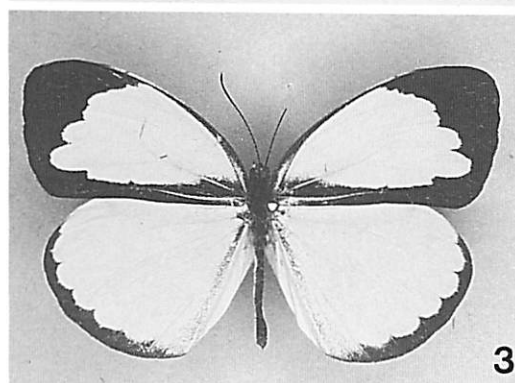
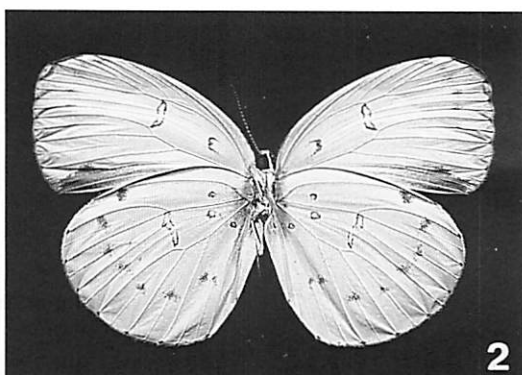
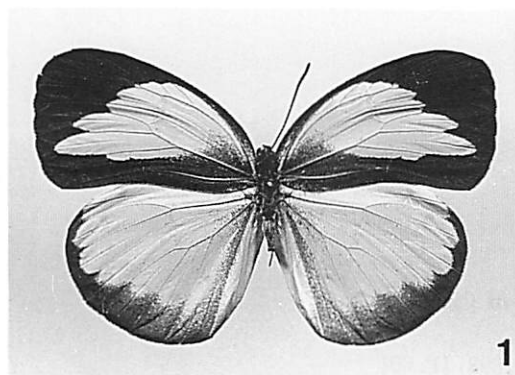
1. ♀. Java.
2. Ditto, underside.

Eurema tilaha myria (FRUHSTORFER, 1913) [P. 56]

3. ♂, holotype [BMNH]. Bali.
4. Ditto, underside.
5. ♀. Bali.
6. Ditto, underside.

Eurema nicevillei nicevillei (BUTLER, 1898) [P. 60]

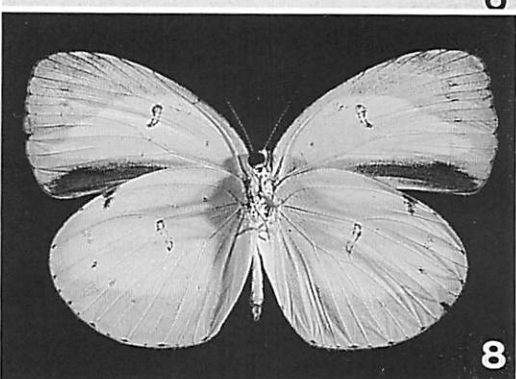
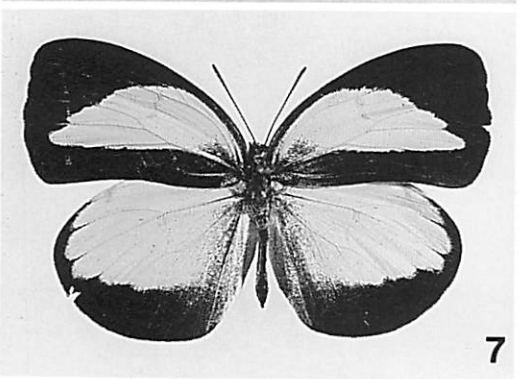
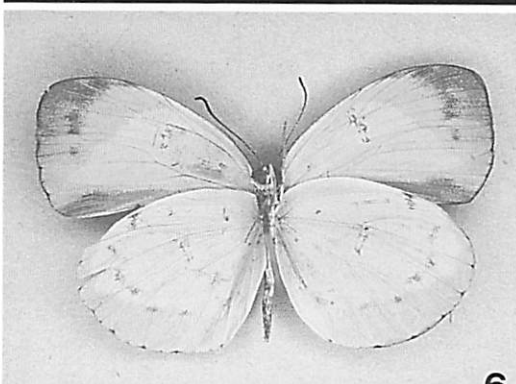
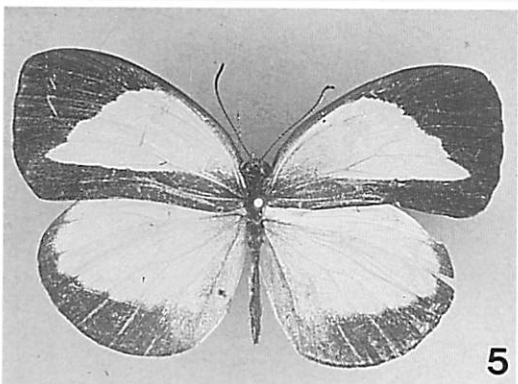
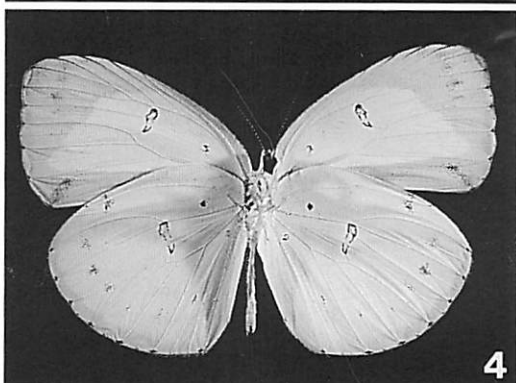
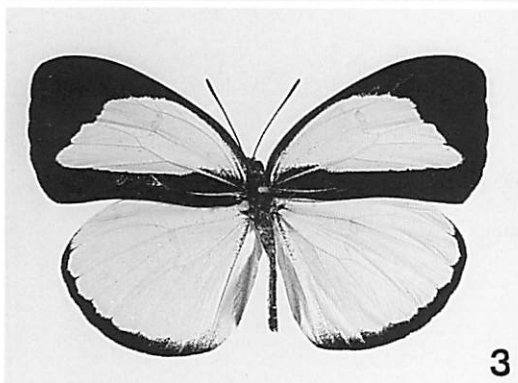
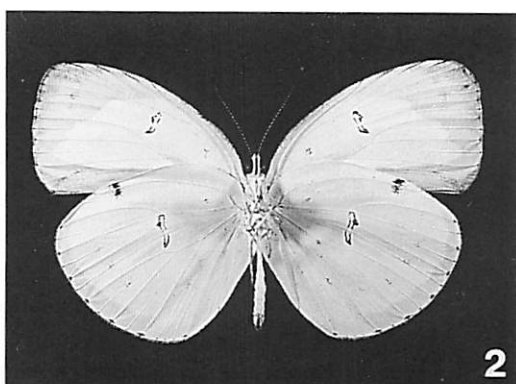
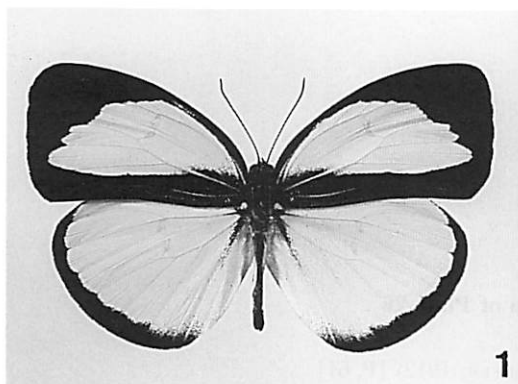
7. ♂, lectotype [BMNH]. N. E. Sumatra.
8. Ditto, underside.



Explanation of Plate 25

Eurema nicevillei nicevillei (BUTLER, 1898) [P. 60]

1. ♂. N. Borneo.
2. Ditto, underside.
3. ♂. Langkawi Is.
4. Ditto, underside.
5. ♀, paralectotype [BMNH] N. E. Sumatra.
6. Ditto, underside.
7. ♀. Langkawi Is.
8. Ditto, underside.



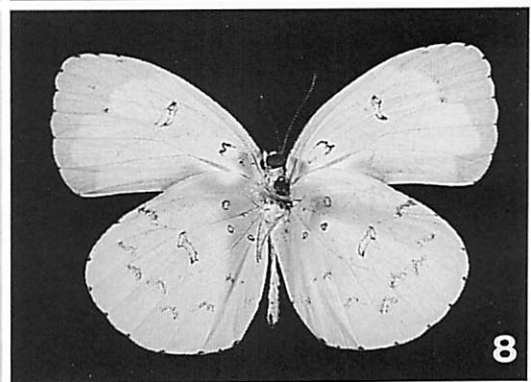
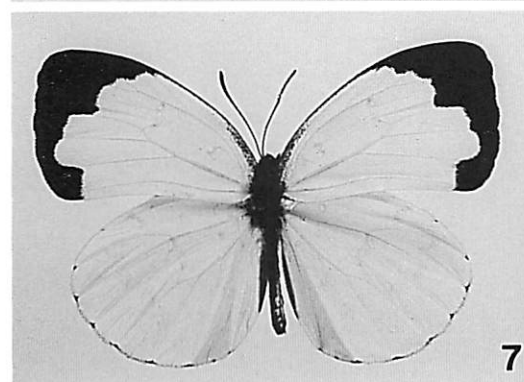
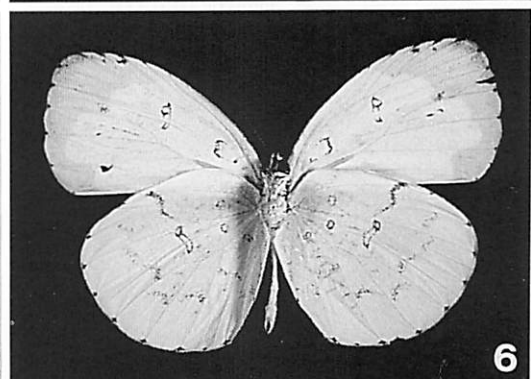
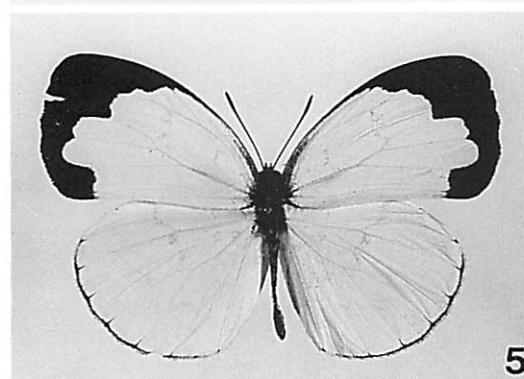
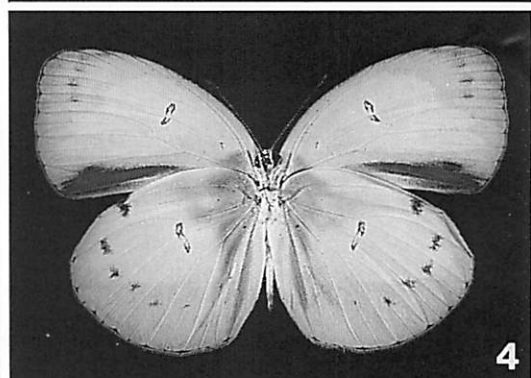
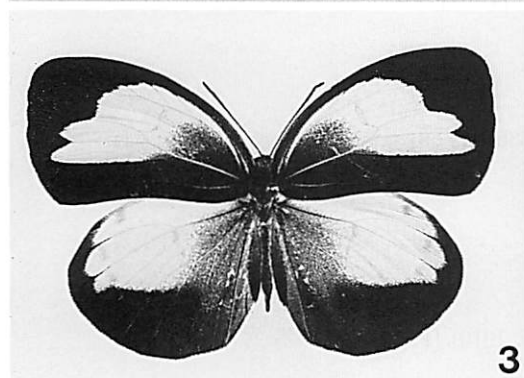
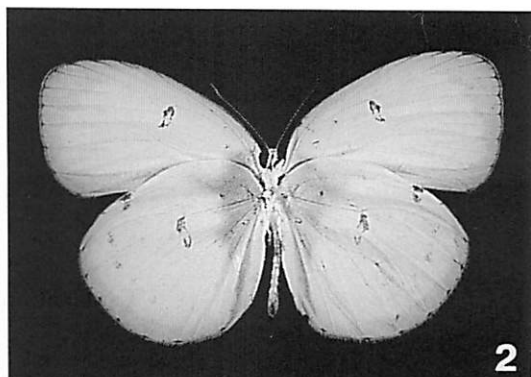
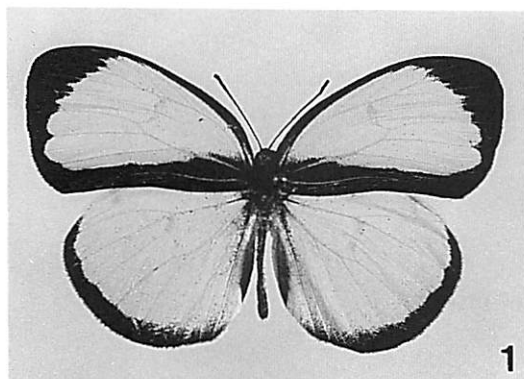
Explanation of Plate 26

Eurema nicevillei lamperti (FRUHSTORFER, 1912) [P. 61]

1. ♂. Sibert Is.
2. Ditto, underside.
3. ♀. Sibert Is.
4. Ditto, underside.

Eurema novapallida YATA, nom. nov. [P. 62]

5. ♂, holotype [KUCGE]. S. Vietnam.
6. Ditto, underside.
7. ♂. N. Thailand.
8. Ditto, underside.



Explanation of Plate 27

Eurema novapallida YATA, nom. nov. [P. 62]

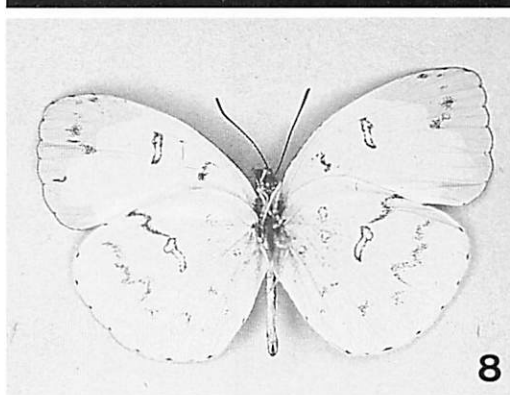
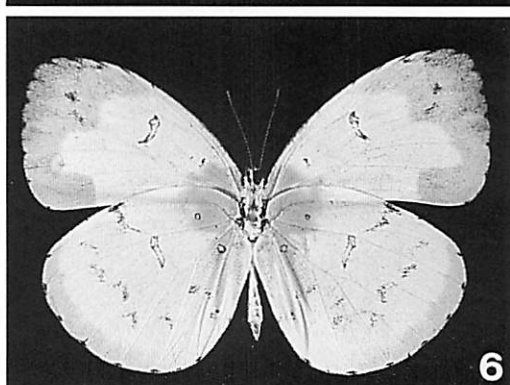
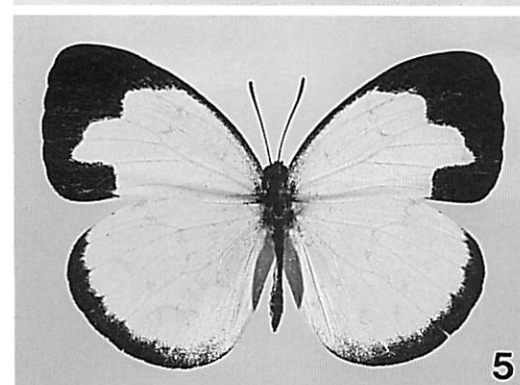
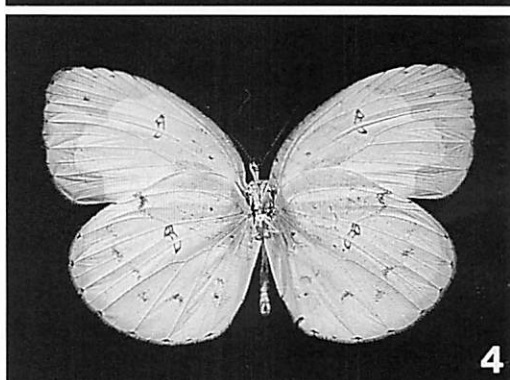
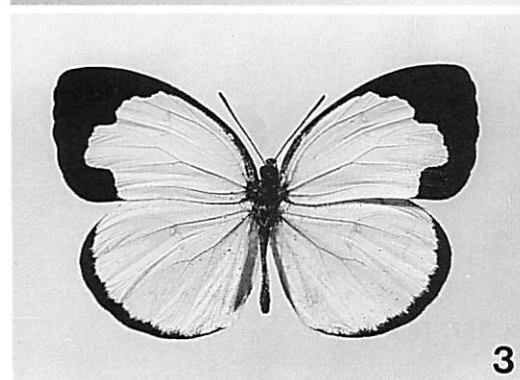
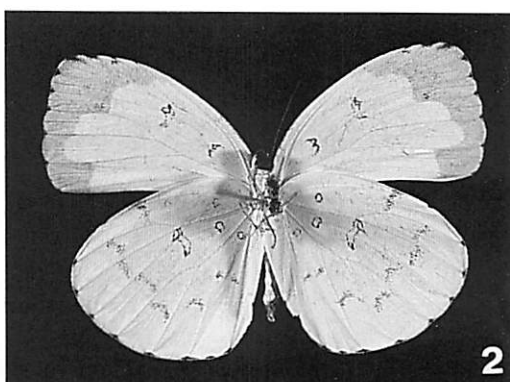
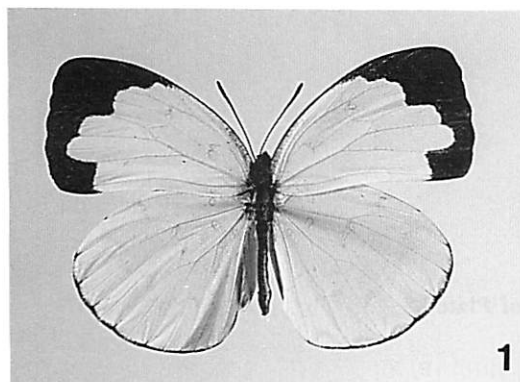
1. ♀. S. E. Thailand.
2. Ditto, underside.

Eurema lacteola lacteola (DISTANT, 1886) [P. 69]

3. ♂. Malay Peninsula.
4. Ditto, underside.
5. ♀. N. Borneo.
6. Ditto, underside.

Eurema lacteola varga (FRUHSTORFER, 1910) [P. 70]

7. ♂, holotype [BMNH]. Java.
8. Ditto, underside.



Explanation of Plate 28

Eurema lacteola varga (FRUHSTORFER, 1910) [P. 70]

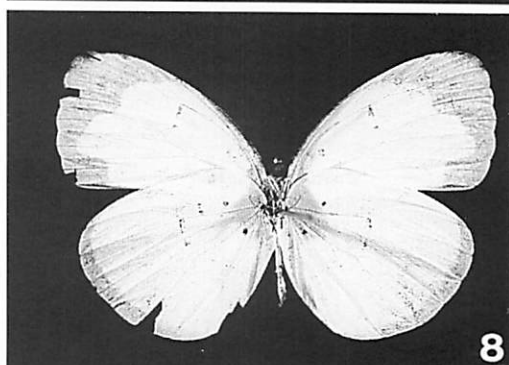
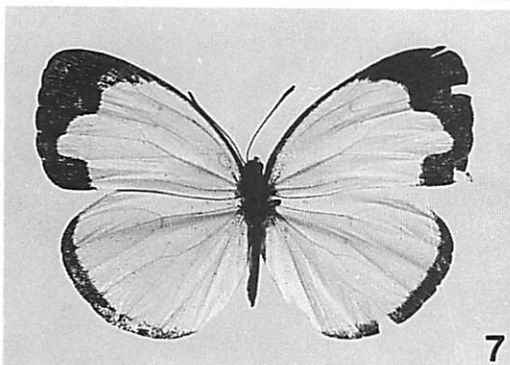
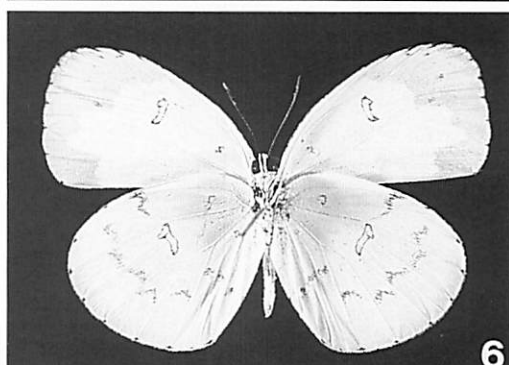
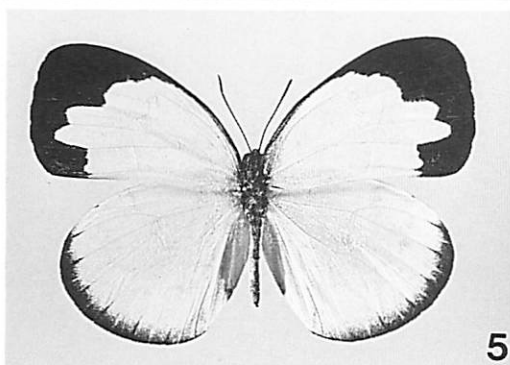
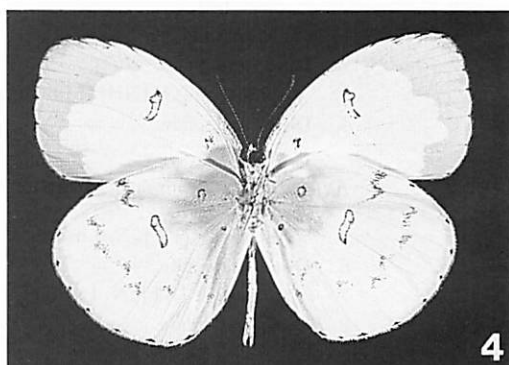
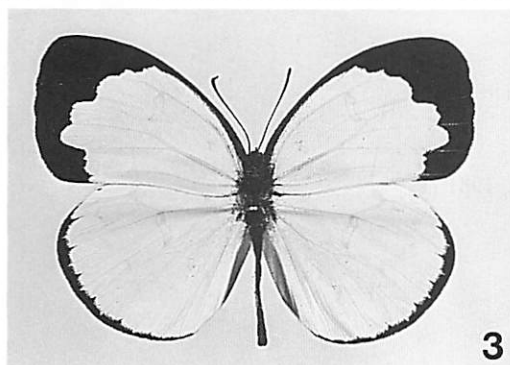
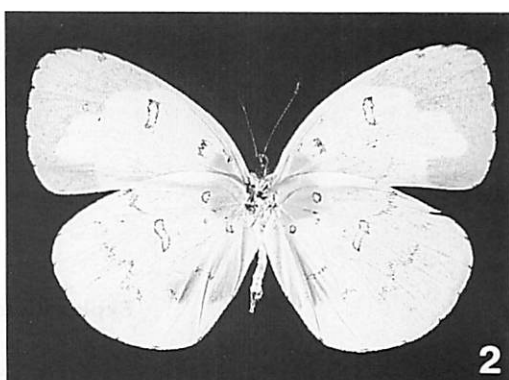
1. ♀. E. Java.
2. Ditto, underside.

Eurema lacteola baliensis YATA & MORINAKA, 1990 [P. 71]

3. ♂, holotype [KUCGE]. Java.
4. Ditto, underside.
5. ♀, paratype [KUCGE]. W. Java.
6. Ditto, underside.

Eurema hiurai hiurai SHIRÔZU & YATA, 1977 [P. 76]

7. ♂, holotype [OMNH]. Mindanao.
8. Ditto, underside.



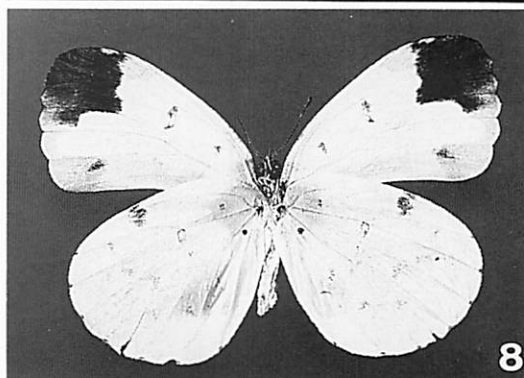
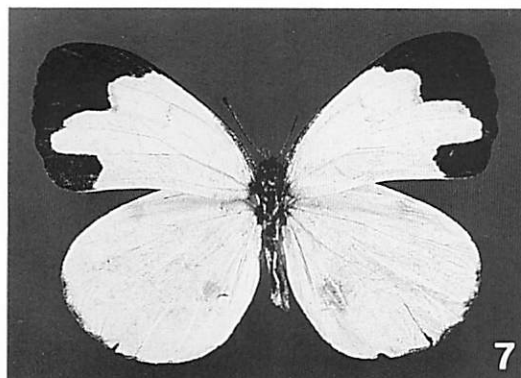
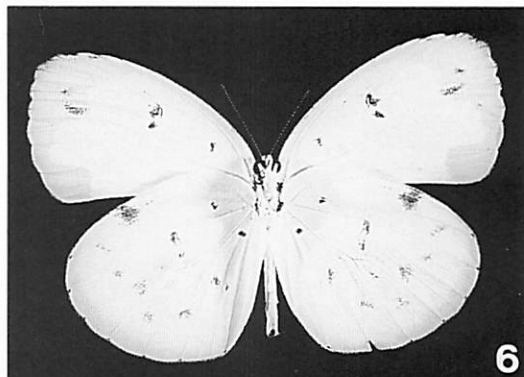
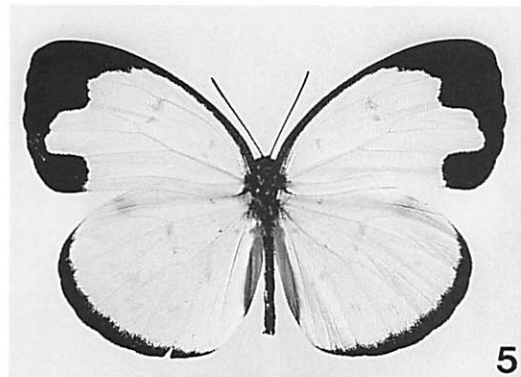
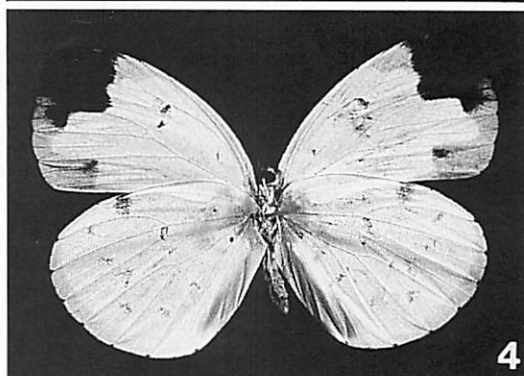
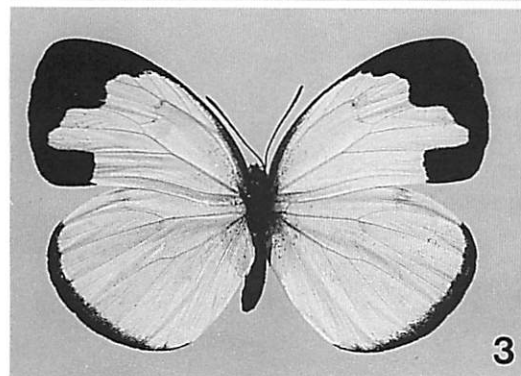
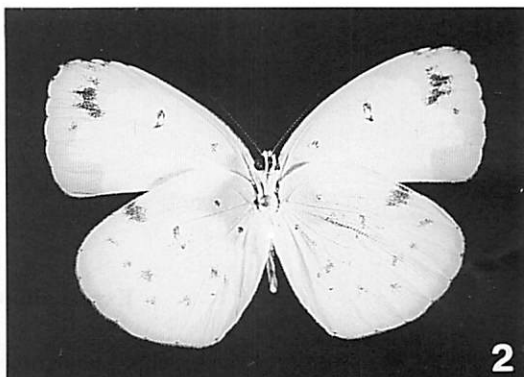
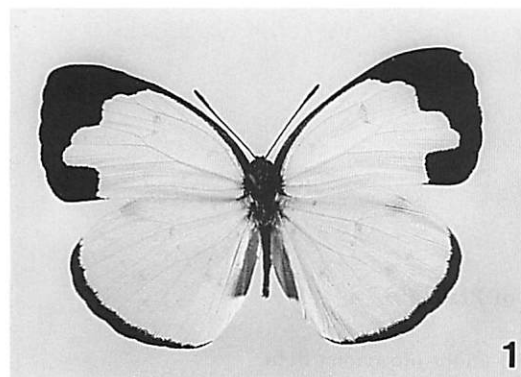
Explanation of Plate 29

Eurema hiurai hiurai SHIRÔZU & YATA, 1977 [P. 76]

1. ♂. Mindanao.
2. Ditto, underside.
3. ♀, paratype [OMNH]. Mindanao.
4. Ditto, underside.

Eurema hiurai admiranda MORISHITA, 1981 [P. 77]

5. ♂, holotype [ET]. N. Luzon.
6. Ditto, underside.
7. ♀, paratype [ET]. N. Luzon.
8. Ditto, underside.



Explanation of Plate 30

Adults of *Eurema* spp. photographed under ultraviolet light.
(Male: upper, female: lower.)

1. *Eurema tominia tominia* (VAN VOLLENHOVEN, 1865), Sulawesi.
2. *Eurema tilaha tilaha* (HORSFIELD, 1829), Java.
3. *Eurema nicevillei nicevillei* (BUTLER, 1898), N. Borneo.
4. *Eurema novapallida* YATA, nom. nov., Thailand.
5. *Eurema lacteola lacteola* (DISTANT, 1886), N. Borneo.
6. *Eurema lacteola varga* (FRUHSTORFER, 1910), Java.
7. *Eurema lacteola baliensis* YATA & MORINAKA, 1990, Bali.
8. *Eurema hiurai hiurai* SHIRÔZU & YATA, 1977, Mindanao.
9. *Eurema hiurai admiranda* MORISHITA, 1981, Luzon.

